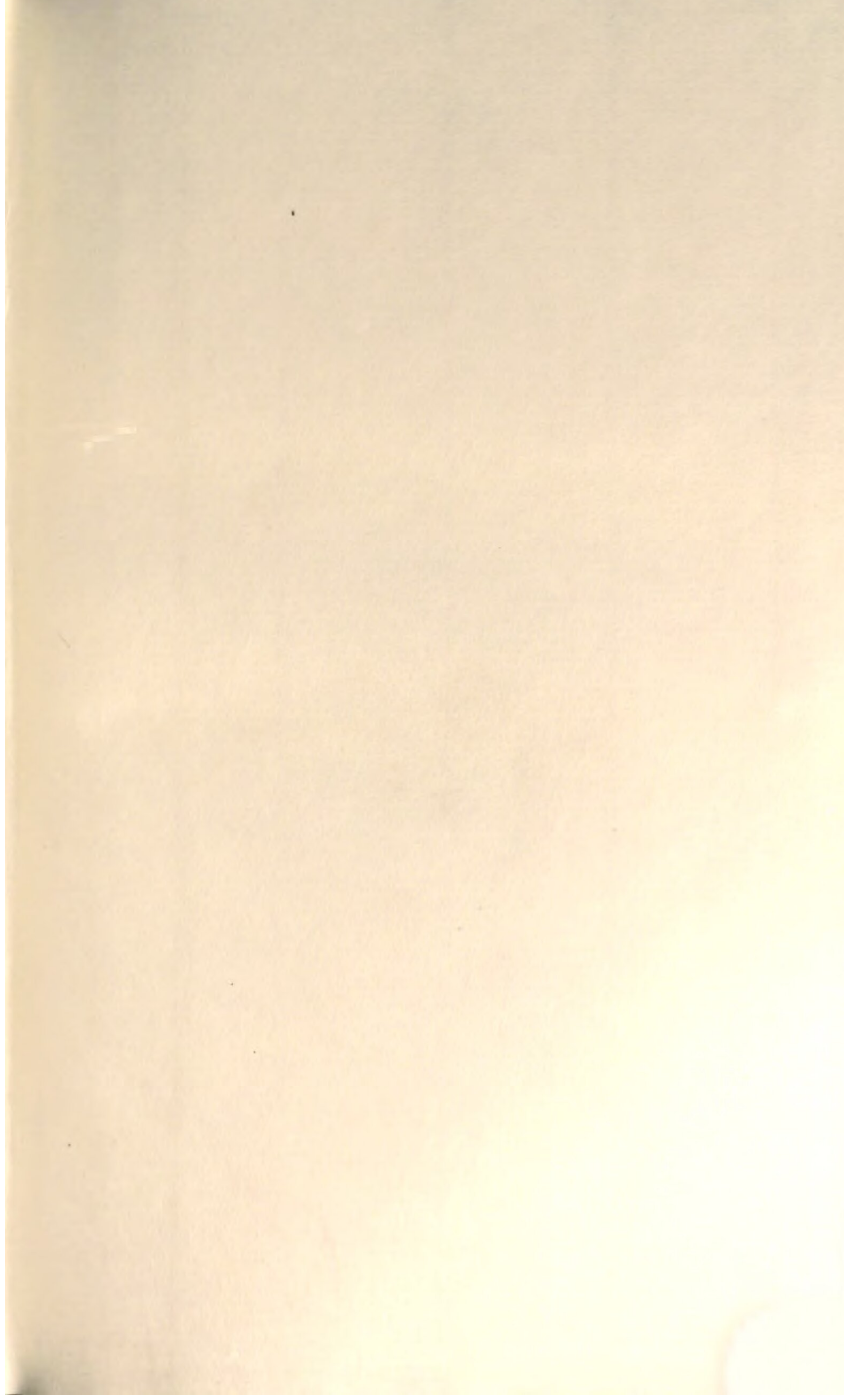


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Elements of Geometry

NEW YORK

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DUBOST'S
Elements of Commerce.

A NEW EDITION.

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1818.

BY CHRISTOPHER DUBOST.

SECOND EDITION.

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THE
ELEMENTS
OF
COMMERCE;
OR,
A TREATISE
ON
DIFFERENT CALCULATIONS,
OPERATIONS OF EXCHANGE,
ARBITRATIONS OF EXCHANGE,
SPECULATIONS IN EXCHANGE AND BANKING OPERATIONS,
Exchange Circulations, Operations of Specie and Bullion,
PARS OF EXCHANGE AND OF COINS,
PRACTICAL SPECULATIONS IN MERCHANTIZE,
Description and Tables of
MONIES, WEIGHTS, AND MEASURES,
AND
TABLES OF LOGARITHMS:
BEING A COMPLETE
System of Commercial Calculations.

BY CHRISTOPHER DUBOST,

Formerly Engineer, and Author of "Commercial Arithmetic," &c.

SECOND EDITION,

Greatly improved, and corrected to the present Time,

BY THE EDITOR OF "MORTIMER'S COMMERCIAL DICTIONARY."

London:

PRINTED FOR BOOSEY & SONS, BROAD STREET, EXCHANGE; LONGMAN, HURST, REES, ORME, AND BROWN, AND SHERWOOD, NEELY, AND JONES, PATERNOSTER ROW; LAW AND WHITTAKER, AVEMARIA LANE; J. RICHARDSON, AND J. M. RICHARDSON, CORNHILL; AND C. BROWN, DUKE STREET, LINCOLN'S INN FIELDS.

1818.

Preface

TO THE FIRST EDITION.

WHILE the work which I am about to submit to the Public was yet in its infancy, I took occasion to recommend it to the patronage of one of the most eminent merchants of this city. "Have you, then, indeed determined," said he, "to write upon commerce? Our accounting-houses are already encumbered with books for which we have subscribed, and of which, however, we do not make any use. Do you consider, that, by adding another to the number, it may not have any better fate than that of being consigned, with the self-praised productions of other authors, to dust and to oblivion?"

"If you do not make use of those works," replied I, "the reason is obvious—they are destitute of merit. If you could derive any use from them, their existence, otherwise than as lumber, might, in general, be protracted beyond the perusal of their title-pages. They have been written by persons, who, without being men of business, undertook to reason upon what it was not in the nature of things they should understand."

"Believe me," replied my friend, "the subject which you have undertaken is exhausted: the most that you can effect will be to recompile compilations; and I would earnestly advise you to spare yourself the mortification that awaits you."

I was proceeding to rejoin, that, having felt an utter disgust of the compilations upon commerce, nothing was more foreign from my purpose, and from my inclinations, than to tread over the beaten track of dulness and of impertinence, when an accident occasioned our separation.

In speaking thus of the publications extant upon the practice of Commerce, I naturally excepted a few works of merit which have appeared abroad. In fact, the reverence which I cherish for the labours of the celebrated Kruse, prompts me to acknowledge with satisfaction, that the description of monies, weights, and measures, and their respective tables, which form one quarter of

ELEMENTS of COMMERCE, are founded upon those of the Hamburg Kontorist.

The publication of the former has not originated in any ordinary combination of circumstances: the obstacles incident to the undertaking have served, I trust, to quicken my exertions, while the labour to embody them has necessarily been sturdy. I shall not enlarge upon this subject, not only as it would not at all interest the public, but as it is my wish that the merchants, in particular, should judge of the production by its intrinsic merit, abstractedly from any other consideration. If my book be not better than those which have preceded it, I do not solicit protection; but if the information which it contains be in every case found certain; if my calculations be invariably exact; in a word, if the work may be consulted with confidence, it will unquestionably be useful, and its utility must ensure its success.

As, however, The **ELEMENTS of COMMERCE** constitute, under every point of view, a new production in this country, it is fit that, in the first instance, the public should form their own opinion as to the subjects chosen, and to the manner in which they are treated.

London, Dec. 16, 1805.

PREFACE TO THE SECOND EDITION.

IT is now upwards of Twelve Years since this Work was first introduced to public notice, during which time some alterations have taken place in the Exchanges upon the Continent, as also in the Monies and Regulations of Exchange in the East Indies. Having carefully perused this Work, and pointed out some few errors and omissions in it to the Author (now resident at Paris), with his approbation I have corrected them with all possible care; and, should I have omitted any thing to make this present Edition perfect, I beg the favour of a Communication to that effect, addressed to Messrs. BOOSEY and SONS, Old Broad Street, Royal Exchange, which will be thankfully received by

The Editor of the "**COMMERCIAL DICTIONARY**."

London, April 1818.

EXPOSITION of the PLAN.

First Chapter.

THE science of commercial calculations, and the knowledge of the monies, weights, and measures of foreign countries, are the subjects of which I have undertaken to treat in the course of this work.

With a nation whose greatness and whose power are inherent in its commerce, whatever may tend to elucidate the theory, or to extend the practice, of the intercourse of profit, has a silent but prescriptive claim to the attention of Government.

Upon the same principle it is, that whatever may tend to aid the conception, and to facilitate the execution, of the operations of merchants, whatever, in a word, may be effected by calculation to ensure success, or to obviate loss, cannot fail of exciting a permanent interest in the several mercantile classes of the community.

A work of the description of *The ELEMENTS of COMMERCE* may not, indeed, be wanted in respect to the trade of England with her colonies, since not any science is requisite for the importation of their produce; but the case must evidently be very different when we change the scene to the distribution of a very considerable part of such produce to continental purchasers. In fact, to effect that distribution, as well as the exportation of our manufactures, it is expedient to examine which may be the place that will afford the most advantageous market; and this can be effected only by preliminary calculations. In like manner, when we are about to import the raw materials, or national produce, furnished by the different countries with which we trade, the choice of the place whither we should direct our speculations is naturally the consequence of comparative calculation.

To determine such calculations, it is indispensable to know in what manner the courses of exchange are fixed, and to be able to resolve the operations which are derived from them. It then becomes expedient to ascertain whether the greatest advantage may be obtained by drawing, or by remitting, either by a direct opera-

tion, or by adopting any of those combinations of business which are known under the denomination of *arbitrations of exchange*.

Again : as the exchanges resulting from the commercial relations of two countries have a necessary tendency to balance each other, it is important to know the operations relative to the importation and exportation of bullion and specie ; such operations being absolutely supplementary to commerce in merchandize. The calculations to which I have referred, require, however, a knowledge of the monies, weights, and measures of the several commercial nations, inclusively of their respective divisions and relations. Indeed, it may be said with truth, that the possession of such knowledge, and the means of reducing it to practice, are mutually dependent.

The wisdom of the British Government, its constant attention to the commercial interests of the country, and the celebrated Navigation Act, have exalted Great Britain to the dominion of the seas. Her maritime power and commercial consequence being thus in the reciprocal relation of cause and effect, every thought and every effort should be directed to the preservation of the one no less than to that of the other.

While composing *The ELEMENTS of COMMERCE*, my ideas have been constantly directed to one object, which is that of being useful ; and, if I should not be found entitled to a degree of praise, I do not hesitate to expose myself to plenitude of censure, by acknowledging that the work, such as it may be, is commensurate with the extent of my powers. The public will determine as to the result : its decision will be without appeal, and leave, if unfavourable, my cause defenceless.

In conceiving the plan of *The ELEMENTS of COMMERCE*, I considered that the calculations which I was about to present to the public, were, in general, of a nature different from those which are taught in schools ; that young merchants, after having finished their education, would not willingly revert to elementary studies ; and that, fraught with veneration for the profound science of their preceptors, they would disdain to learn whatever had not been included in the circle of their tuition. In fact, as we think in our childhood as others teach us to think, we naturally adopt their prejudices ; and even when we arrive at an age when we presume that we possess an independent power

of exercising our faculties, we continue to think by the perception of others, as long as the prejudices which others have imparted retain their empire. Hence I concluded that *The ELEMENTS of COMMERCE* would be usefully preceded by a treatise upon Commercial Arithmetic, intended as an essay to change the system of teaching hitherto adopted in schools.

In order, however, to attack with propriety ideas generally received, strengthened by prejudice, and consecrated, as it were, by habit, it is necessary to have recourse to the incontrovertible reasonings which are inseparable from truth, and which it is the first duty of a writer to place in a point of view the most simple, and therefore the most forcible.

Our Treatises upon Arithmetic, upon Geometry, and upon Algebra, are almost always begun by axioms, definitions, and principles. In order, however, thus to accumulate these distinctions, they must have been previously established; and in order to establish them, a certain track must have been followed: such track cannot be any other than that which nature has pointed out to us, of decomposing a whole into its parts, and afterwards of recomposing them.

At the first perception of a *prospect*, I see every thing, but do not discern any part in particular. In order, then, to obtain this particular knowledge, it is necessary to examine each part in succession. Beginning, therefore, with the principal objects, I observe them in order, and judge, by comparison, of their relations. Having by this means acquired a knowledge of their respective situations, I observe in succession all the objects which occupy the intervals, and, by comparing each with the adjacent principal object, an accurate idea is formed of their several positions.

From this moment, at the same time that I distinguish all the objects whose form and situation I have perceived, the view of the whole is entire. The order, therefore, in which the component objects are represented in my mind is no longer successive, but simultaneous. It is the same order in which those objects themselves exist; and instead of seeing them, as at first, in a confused and indeterminate manner, I perceive them, at one view, both distinctly and collectively. What I had decomposed being now recomposed, the process is complete, and its purpose answered.

In like manner, if I were desirous of obtaining an accurate per-

ception of a machine, I should decompose it, in order to study each of its parts by itself. As soon as I might have formed a precise idea of the composition of each, and of the relation of the one to the other, and be able to replace the several parts in their order of artifice, I should then have a perfect conception of the machine itself; in a word, I should have decomposed and have recomposed it.

This process is called *Analysis*. Hence, to analyse is merely to observe the qualities of an object, either in its natural or in its artificial order, to the end that such qualities may be represented in the mind in the relative and collective order in which they exist.

In studying the sciences by analysis, the progress is easy, by the order which is observed, and obstacles are removed by the transition from what is known to what is unknown.

Such was the track which the philosophers at first followed, and it was that to which they ought to have adhered: they analysed the propositions which they considered, and obtained general results, being such as were applicable to every other proposition of a similar nature. From such results they deduced axioms, definitions, and principles; the sober practice of analysis was abandoned, and, while every thing was defined, not any thing was explained. The works of the philosophers were thus begun by that with which they ought to have been concluded: the method itself was dignified with the appellation of *Synthesis*, and obtruded upon the world as the method of learning. It is thus that the philosophers erred, and that their errors have been adopted by posterity.

In fact, to be enabled to conceive ideas which are new to me, it is necessary that they be elicited from those which I may already possess. Whatever I do not know, whatever it is possible that I may learn, must be considered as a new link to be added to the chain of previous knowledge; and if there be a method to impart any subsequent knowledge, it must be the same as that by which you may yourself have acquired it. If you were to reflect upon the manner in which you have obtained instruction, you would easily impart to me what you have yourself discovered. Whence is it, then, that you begin my instruction by what is the complement of your own? Why do you accumulate axioms, definitions, and principles, till science appear less your

object than difficulty and embarrassment? You do not perceive that you speak a language which I do not understand, and which, indeed, is not to be understood. Hence, being unable of surmounting the difficulties which you have created, I reject with disgust the book which you present to me.

Analysis, considered as to its process and as to its effects, is properly the *lever* of the mind: to it we are indebted for the invention of the arts and sciences, and for the means of bringing them to perfection. Analysis is the precursor of every discovery; and, without it, even the imagination itself, which is considered as the parent of talent, would be but a source of vague opinions, of prejudices, and of errors.

There are minds replete with judgment, such as does not appear to be an effect of study, but which is, in fact, an effect of quick perception and of extensive power of combination. As the study of persons thus organized is effected without any premeditated design, they do not think of taking lessons from any master, and they have the best master of all, which is nature; for it is nature which teaches them to analyse the things which they study, and the little which they know is well known.

There are men of minds perversely organized who are deep in study: they plume themselves on possessing much method, but it is such as *only tends to deteriorate* their judgment. In fact, when a method is not good, the more it be followed, the more it will mislead. Vague notions, and words devoid of sense, are by such persons adopted as principles: they compose a scientific jargon, expressive, as they imagine, of evidence, but which is alike deficient in truth as to what has been seen, or thought, or said. Thus we can never analyse our thoughts but inasmuch as they may be themselves derived from analysis. It is, therefore, by analysis, and by analysis only, that we can accomplish our own instruction. Being the manner the most natural, it is the most simple, and we shall see, in the course of this work, that it is also the most short. Let us cease, then, to begin our books by axioms, definitions, and principles; and instead of the language of obscurity, let us endeavour to be clear and intelligible. In a word, it is hoped that good sense will prevail in this instance over habits, however inveterate.

Second Chapter.

The occasion for commercial calculations recurs so frequently, and their use is so very necessary, that we cannot be too strenuous in our endeavours to advance them to the highest degree of simplicity and of perfection. The mathematics afford the means of compassing this desirable purpose; and to bring them to bear upon this subject, is the object which I have had in view.

In the number of treatises published abroad upon the practice of Commerce, there are several from which their authors have derived a well-earned reputation. In particular, *Ricard* among the Dutch, *Giraudeau* among the French, and *Marien* among the Spaniards, stand eminently distinguished; and, above all, *Kruse*, to whose labours the city of Hamburg is so much indebted. Their works, however, are not elementary; and, however useful they may be to those who are initiated in calculations, they are, as it were, out of the reach of others who have not that advantage.

The plan of those authors has not been such as nature suggested to them; they have not presented their information to their readers in the order, and with the method, by which they acquired it themselves. Hence it is that the study of their works is subject to extreme difficulty; that the attention of the student is not directed from object to object in succession; that their rules for calculation are not demonstrated; that the subjects which they have undertaken are rather sketched than profoundly treated; and, lastly, that, by want of a well-arranged division of the matter of their works, they have not been able to embrace the calculations of commerce in the extent of which they are susceptible.

It has thus happened that there are not any elementary books by which such calculations might be learned; and, as we cannot sufficiently appreciate that which we know but imperfectly, it is not surprising that the calculations of commerce be so little the object of study, and that many merchants regard them, as to theory, with indifference. Perhaps I shall be asked, How then are they learned? To which I shall reply, By the tradition of accounting-houses. In every branch of business there are certain operations which frequently recur, and which therefore become familiar. We know, that, in order to resolve them, it is required

to multiply by a certain number, and to divide by a certain other; and, at the very moment when we mechanically perform operations similar to those which we have repeatedly seen, we are often incapable of determining those whose solution is beyond the pale of our habits, even though such operations be absolutely collateral to the former. Nevertheless, if the treatises of arithmetic in use in our schools had been limited to the production of a small number of examples, accompanied by good demonstrations, in lieu of very many examples which are destitute of demonstration; if they had been properly addressed to our intellect, and that they had taught us that the results derived from the analysis of an operation are applicable to the solution of every operation of a similar nature, we should know that calculations of the same kind, being subject to the same laws, may be respectively resolved by one and the same process.

In treating of the calculations of commerce, I shall endeavour to make them known by the method which I have myself employed to acquire the knowledge of them. I shall begin by those operations which are the most simple, and, proceeding to those which are more complicated, according to their connection with the series, I shall attempt a gradual removal of difficulties, with a view to enable my readers to overcome any future obstacle, without any other aid than that of the exercise of their own intelligence and individual application. For this purpose I shall not outstep the ideas which they may have upon the subject, admitting that they be familiar with the theory of fractions and of proportions; and, if they should not possess such information, I would refer them to the "*COMMERCIAL ARITHMETIC*," commencing at the lowest point of the scale.

I shall now endeavour to convey a precise notion of the several subjects contained in the course of this work.

Of different Calculations.

My attention has been directed, in the first instance, to the calculation of tare and of tret; they frequently occur, and their simplification is useful. From such consideration I have proceeded to that of the calculation of commission, of brokerage, and of premiums of insurance. I have then treated of the calculation of interest, of which I have given a new demonstration; adverting, at the same time, to the methods severally used by the principal commercial nations.

Of Operations of Exchange.

The solution of exchange-operations is of great importance in business. The persons who have undertaken the laborious compilation of tables of exchange, have thought, perhaps, to add to their utility by giving examples, which, however, they have done in a manner to introduce difficulty where not any should exist. In fact, admitting a knowledge of the divisions and of the relations of monies, as well as that of the construction of a course of exchange, nothing more is requisite, in order to solve any kind of proposition, than to select the numbers appertaining to the dividend and to the divisor, when the respective multiplications and divisions may be immediately effected.

After having penned certain preliminary ideas upon the theory of exchanges, I have devoted my attention to the relative calculations; and, with a view to resolve them with facility, by means of the ready determination of the dividend and of the divisor in each operation, I have introduced a new rule in business, which I have denominated the *rule of equation*, and of which I have demonstrated the principle and the consequences. While applying this rule to the principal operations of exchange of each place and country, according to an alphabetical arrangement, I have severally prefixed to them a description of their respective monies of exchange and of account, as well as of the various regulations in use, and an explanation of their respective quotations of exchange.

Of Arbitrations of Exchange.

In regard to three given places, there are necessarily as many kinds of exchange, and there cannot be more. When two of any three exchanges be known, the object of arbitrations, in general, is that of determining, by the combination of the two, the third exchange, which will be in proportion to the former. Having before me a quotation of all the exchanges current at a certain place, and also a similar quotation from another place, I am enabled, by means of a successive combination of the nature just described, to discover the proportional exchange between either of the two places whence the quotations have been received, and each of those places which are respectively enumerated in the quotations themselves.

It is by the determination of proportional exchanges that we

are guided in the choice of an intermediate place affording the greatest advantage, either as the place upon which we should draw, or as that to which we should remit; and, as we are our own *arbiters* in such cases, the name of *arbitration* has been given to this kind of operations.

Arbitrations of exchange are, therefore, properly speaking, one of the means of commercial economy; and a familiarity with such means may be considered as the basis of the science of a merchant. In treating of this description of calculations, I have made mention, in the first instance, of the rule of conjunction, which is generally used for their solution. I have, at the same time, pointed out the relation between that rule and the rule of equation, of which I have already spoken, and which, indeed, I have preferred, as it possesses the obvious property of simplifying the calculations in question, by determining at once, and by a method easily apprehended, the dividend and the divisor in each operation.

After having described the principal operations of the arbitrations between London and those of the places upon the continent where affairs in exchanges are the most considerable, and then proceeded to their solution by the means of common arithmetic, I have again effected the solution of the same operations by *logarithms*. In mentioning this word, I have to request that those of my readers who may not yet have made use of logarithms, will lay aside any sinister prepossession upon the subject; for I can assure them, that, to calculate by logarithms, is neither more nor less than to make an addition instead of a multiplication, and a subtraction instead of a division.

Actual operations of arbitrations of exchange necessarily give rise to charges of commission, of brokerage, and of postages of letters, to be paid in the intermediate places which are employed; and the consideration of this matter is as difficult as it is important. After having specially investigated the subject, I have treated of several other rules of minor importance; and I have concluded this part of my work by a rule tending to shew the profit per cent resulting from each operation.

Of Speculations in Exchange and Banking Operations.

Speculations in exchange are generally undertaken by merchants in proportion to their respective capitals and degree of familiarity with the subject. It follows that such operations may

assume an almost infinite number of shapes ; and, in order not to exceed the bounds which I had set to my work, I have thought it expedient to confine myself to the analysis of two operations of frequent recurrence in business, and which will serve to give a precise idea of this description of enterprize.

Speculations in exchange are necessarily followed by banking orders, which are transmitted by the principals to their correspondents. When such orders cannot be executed in strict conformity to the conditions prescribed, it is of importance to consider whether, notwithstanding the variations which have ensued in the courses of exchange, it be not practicable to effect the orders at the existing rates of exchange ; or, in other words, to consider whether the new combination may not afford similar results, in the aggregate, to those which the speculator contemplated. I have, therefore, concluded this treatise by two rules, which serve to determine those cases in which any given order may be executed within the limits prescribed, and I have subjoined the application of those rules to several examples relative to banking orders, both simple and compound.

Of Exchange Circulations.

The extent to which circulations of exchange are carried is generally determined by the casual wants of those who undertake to obtain the temporary use of a capital, according to the degree of credit which they may enjoy. When considered, however, not as an expedient, but as creative means of advantage, circulations of exchange require, in the principal, perspicacity of combination, and, in the agents, intelligence of execution.

The consideration of this branch is of great importance. While the practice is of much use to merchants, by the assistance which it affords as to an extension of their speculations, it is still more useful to governments, by facilitating the means of payment of any subsidies which they may have stipulated to grant. I have therefore spoken of exchange circulations under both these points of view, and I have concluded the first part by a description of a very extensive circulation which took place in the course of the year 1804, upon occasion of the payment of a subsidy by Spain to France. An operation of this nature, rather than general reasoning, will evince the utility of a knowledge of arbitrations ; the latter being the basis of speculations in exchanges, and of the circulations to which I have adverted.

Of Operations of Specie and Bullion.

After having considered the several branches of exchange under their respective points of view, I have proceeded to other operations intimately connected with those in exchange, namely, the operations relating to the importation and to the exportation of precious metals, either in bars or in coin. Having directed my attention, in the first instance, to certain preliminary points, I have afterwards treated of this branch of commerce between England, France, Hamburg, Holland, Portugal, and Spain. I have successively detailed the degrees of purity severally required in the sale of precious metals in those countries; the weights by which they are sold; their division and relation, as well as the respective conditions of sale. Lastly, after having specially directed my endeavours to the simplification of the calculations of the accompting-house, I have concluded this treatise, of no less importance than novelty in business, by forty-five operations, in which the dividend and the divisor are determined by the rule of equation, and the solution of which is effected by means of fixed logarithms, so as to reduce whole pages of figures to one addition and to two subtractions at most, and sometimes even to a simple addition, or to a simple subtraction.

Of Pars of Exchange and of Coins.

From the treatises upon operations of exchange in general, and of those relating to the trade in precious metals, the transition is natural to the consideration of pars of exchange and of coins, which may now be readily explained. In attempting to refute the errors sanctioned by writers who have spoken of the intrinsic par of exchange, without having correctly understood the subject, I have proved, that, in respect to two countries, there must be two pars of exchange, the one resulting from a comparison of their coins of gold, and the other from that of their coins of silver, and that these pars must remain distinct. I have then pointed out the method of calculating them; and, after having treated of the par of coins, and of the *eventual* par of exchange, I have concluded this part of my work by twenty-two operations, in which I have determined the intrinsic par of exchange between London and those countries or places with which an exchange is open, by means of a single equation founded upon the successive

comparison of gold and silver coins, in respect to their weight, standard, and value.

Of Practical Speculations in Merchandize.

The calculations which are made to discover the advantages that may result from the importation or the exportation of merchandize, are, in general, the most difficult, by reason of the number of data to be considered; and hence it is that, though the most essential, they are, of all the calculations of commerce, the least known.

Considered in the aggregate, they are innumerable; and, as it would be foreign from the plan of this work to attempt a multifarious description, I have confined myself to giving an analysis of six operations, to be each of guidance under the following circumstances.

The first, in respect to the intended importation or exportation of merchandize by the criteria of invoices and of accounts of sale, either real or simulate.

The second, in respect to the importation of merchandize by the criterion of an invoice, either real or simulate, as received from abroad.

The third, when it may be intended to export merchandize by the criterion of a real or simulate account of sale received from abroad.

The fourth, when the object be that of grounding a speculation upon a simple price current of merchandize.

The fifth, to determine the practicability of the execution of orders for merchandize.

The sixth, to ascertain the place which may afford the greatest profit, either as that where purchases may be ordered, or where sales may be effected.

This treatise is new, useful, and important. It will interest the mercantile community in general, whether merchants or manufacturers, and I have endeavoured to render it as easy as possible, being of itself the most difficult. In fact, to understand it, and to make use of it, nothing more is required than to be acquainted with the calculation of operations of exchange.

Description of Monies, Weights, and Measures.

After having detailed the calculations of commerce in all their extent, I have described the monies, weights, and measures, of the several commercial nations, by an alphabetical arrangement

of their names. I have successively considered the subjects relating to each country and to each place; and, as I have purposely collected them all under one point of view, repetition has sometimes been unavoidable, particularly in respect to the monies of exchange. In order to obviate any confusion as to the names of the monies, weights, and measures, I have adopted, as far as I have been able, the languages respectively used in regard to the orthography of the names of the places, and of the quantities described. This treatise, which is of considerable extent, is of a degree of importance that can be felt only in proportion to a knowledge of calculations; and, by persons possessing this knowledge extensively, it cannot fail of being very much prized: it will interest almost every class of society, and, above all, travellers and merchants. Without a knowledge of monies, the former are embarrassed in the transactions relative to their expenditure, and the latter expose themselves to the danger of making erroneous speculations.

Tables of Monies, Weights, and Measures.

These tables, the utility of which is evident, serve to determine a comparison between the monies, weights, and measures of England, and the monies, weights, and measures of foreign countries, according to their respective description in the preceding treatise. The same tables relate to the following heads:

The first, to monies of account;

The second, to coins of gold;

The third, to coins of silver;

The fourth, to the weights used in the trade in precious metals;

The fifth, to the weights used in the sale of merchandize;

The sixth, to measures for dry goods;

The seventh, to measures for liquids;

The eighth, to cloth measures;

The ninth, to long measures;

The tenth, to land measures;

The eleventh, to itinerary measures.

Table of Logarithms.

By the Table of this name, *The ELEMENTS of COMMERCE* are concluded. It is short, simple, and adapted to such of the calculations in this work, the solution of which is determined by

logarithms. The instructions prefixed to the table will shew the application of it, which is a matter of the greatest ease. Indeed, it is this property which has prompted me to offer a table of logarithms, such as merchants may be induced to employ in their calculations: it will be observed, however, that it is too limited to be applicable to the solution of calculations in general.

Without dwelling, at present, upon the advantages of this mode of calculation, I shall content myself with saying, that I have been enabled, by means of logarithms, to accomplish that in a month, in respect to the reduction of the monies, weights, and measures of foreign countries, which I should not have been enabled to have accomplished by the means of ordinary arithmetic in a year. And I do not at all doubt but that those who shall have once experienced the pleasing facility of calculating by logarithms, will renounce, for ever, the laborious calculation arising from multiplications and divisions by natural numbers.

By this outline, however faint, of the plan of *The ELEMENTS of COMMERCE*, the reader may now judge that this work is widely different from those which have preceded it. On looking over it, he will perceive, that, with the exception of a very few cases, I have constantly made use of the *universal rule of equation*, by which the dividend and the divisor in each operation are *infallibly* determined; and that I have not had recourse to algebraic calculations, inasmuch as they cannot be necessary but in the solution of certain problems which relate to matters of curiosity, rather than to researches of practical utility.

In treating of the science of calculations, all the rules which I have given originate with myself; and all the operations which I have described are founded upon the present situation of affairs, and upon my own experience and observations. But if I have omitted, in this part of my work, to avail myself of the treatises which have been published upon the practice of commerce, I have necessarily consulted them in whatever related to the knowledge of monies, weights, and measures. I shall esteem myself happy, and feel infinite satisfaction, if the Public judge favourably of the labour which I have undertaken, and decide that *The ELEMENTS of COMMERCE* be of a nature to answer the double purpose---of being useful to accomplished merchants, and of tending to the instruction of others.

OF
Different Calculations.

OF DEDUCTIONS FROM WEIGHTS.

DRAFT is a deduction from the original weight of certain goods, to turn the scale in favour of the buyer.

Cloff, when deducted, is an allowance of two pounds on every bale for the weight of the wrapper in which the merchandise is contained.

To make such deductions, it is only requisite to subtract the amount of the draft, or cloff, from the original weight, and the remainder is called *gross weight*.

OF TARE.

Tare is an allowance for the weight of packages, granted either at so much per cwt. or per 100 lbs., when the real tare is not deducted: if, however, the allowance be less than the real tare, the latter may, by right, be demanded. After the deduction of the tare, what remains is called *net weight*.

Tare is calculated by a rule of three direct, of which the first term is 112 lbs. or 100 lbs., and the second the tare agreed: thus, the third term, which is the gross weight of the merchandise, must contain the fourth term of the proportion, or the tare to be deducted, as often as the first term contains the tare agreed.

Ex. I.—*What is the tare of 138 cwts. 2 qrs. 8 lbs. of cotton at 4 lbs. per cwt.?*

Representing the fourth term by x , I have the following proportion:

$$112 : 4 :: 138 \text{ } 2 \text{ } 8 : x,$$

whence I make the following calculation:

B

$$\begin{array}{r}
 138 \ 2 \ 8 \\
 4 \\
 \hline
 112)554 \ 1 \ 4(4 \text{ cwt. } 3 \text{ qrs. } 22\frac{1}{2} \text{ lbs. result} \\
 106 \\
 4 \\
 \hline
 425 \\
 89 \\
 28 \\
 \hline
 716 \\
 178 \\
 \hline
 2496 \\
 256 \\
 32
 \end{array}$$

As the end of arithmetic is the abridgment of operations, and as the shortest method of dividing may not be generally known, I think it proper to explain the calculation in the preceding example. Having aimed in this work at uniformity of proceedings, I presume that the explanation referred to will suffice for the understanding of all the divisions which will be noticed.

After having seen that the three figures of the dividend can only contain the three figures of the divisor a certain number of times under ten, I find that 554 contain 112 four times, wherefore I write 4 in the quotient's place; and instead of inserting under 554 the product of 112 by 4, to perform the subtraction, I multiply 2 by 4 with the intention of deducting the product 8 from the third figure of the dividend; but as that figure is less than 8, I borrow 10 from the preceding figure, which added to 4, make 14; and deducting 8 from the latter, there remain 6, which I write under the figure 4.

In order to keep account of the ten thus borrowed, instead of supposing the figure 5 reduced by the unit which it furnished, I retain the unit, and add it to the next product. Thus, continuing the multiplication, I say 4 times 1 are 4, and 1 which I have retained make 5; I subtract 5 from 5, and write 0 underneath the latter. Continuing in the same way, I say 4 times 1 make 4, which, subtracted from 5, leave 1.

The 106 which remain are evidently cwts.; therefore, to find how many quarters there should be in the quotient, I multiply 106 by 4, the number of quarters in 1 cwt., and add to the pro-

duct the 1 quarter which has remained hitherto undivided in the dividend, which gives 25, &c. Dividing the product 425 in the manner above mentioned, there remain 89, which are obviously so many quarters. Then, to find how many lbs. there should be in the quotient, I multiply 89 by 28, since 28 lbs. make 1 quarter, adding to the product of 9 by 8, 4 lbs. which are still in the dividend, &c.; and, dividing the product 2496 in the same manner, there remain 32. This number 32 becomes the numerator of the fraction $\frac{32}{112}$; of which the divisor 112 is the denominator, and this fraction is reducible to $\frac{2}{7}$.

It is known, that, without affecting a proportion, its two first terms may be divided by a given number; whence it arises, that, in the before mentioned proportion $112 : 4 :: 138 \text{ } 2 \text{ } 8 : x$, I might have divided the two first terms by the same number 4, and have found the following proportion,

$$28 : 1 :: 138 \text{ } 2 \text{ } 8 : x;$$

and, as the multiplication of 138 2 8 by 1 does not occasion any alteration in the first of these numbers, it is evident that the operation is reduced to dividing 138 2 8 by 28, as follows:

$$28)138 \text{ } 2 \text{ } 8(4 \text{ } 3 \text{ } 22\frac{2}{7} \text{ result}$$

26

4

106

22

28

184

44

624

64

8

And it is seen that the proportion $112 : 4 :: 138 \text{ } 2 \text{ } 8 : x$ has not been affected by the division of its two first terms by the same number, since the result of this last operation is the same as that of the first.

It is acknowledged, that, the more calculations are simplified, the less we are liable to errors in making them. It will therefore be well, if, whenever we have to calculate an amount of tare at so much per cwt., we examine whether the two first terms of the proportion may not be reduced; for instance, if the tare

agreed were 16, the two first terms $112 : 16 ::$ might each be divided by the same number 16, and reduced to $7 : 1 ::$; whence we see, that, instead of multiplying the gross weight by 16, and dividing the product by 112, it would only be requisite to divide the gross weight by 7, which would give the same result.

Ex. II.—*What is the tare of 36420 lbs. at 8 lbs. per cent?*

I state the following proportion,

$$100 : 8 :: 36420 : x,$$

whence the following calculation,

$$\begin{array}{r} 36420 \\ 8 \end{array}$$

$$\begin{array}{r} 8 \\ \hline \end{array}$$

$$1,00)2913,60(2913\frac{3}{5} \text{ result.}$$

It is obvious, that, in this operation, and whenever we have to calculate an amount of tare at so much per cent, it is only requisite to multiply the gross weight by the tare agreed, and to separate the two right hand figures of the product.

N. B. In the calculation of tare, when the remainder of the division is or exceeds $\frac{1}{2}$, it is customary to allow 1 lb. more for that fraction, which is not noticed when it is under.

OF TRET.

Tret is a farther allowance of 4 lbs. in 104 lbs. on the weight of some goods subject to waste, in order that the weight may answer when the goods are retailed.

It has been seen, that the remainder of the gross weight, after the deduction of the tare, is called net weight; but, when tret is allowed, that remainder is called *suttle*, which after the deduction of tret is called *net*; so that the tare is always deducted from the gross weight, and the tret from the *suttle*.

Tret is calculated, in the same manner as tare, by a rule of three direct.

Ex. I.—*Required the tret of 124 cwts. 3 qrs. 16 lbs. of cinnamon.*

It is evident that 104 and 4 are the two first terms of a proportion, of which 124 3 16 is the third; therefore, by representing the fourth term by x , we shall have the following proportion,

$$104 : 4 :: 124 \text{ } 3 \text{ } 16 : x.$$

But as tret is always an allowance of 4 lbs. on 104 lbs., by di-

viding the two first terms 104 and 4 by the same number 4, we have the following proportion,

$$26 : 1 :: 124 \text{ } 3 \text{ } 16 : x.$$

In fact, it is evident that, when 4 lbs. are allowed for 104 lbs., 1 lb. is allowed for 26 ; therefore, instead of multiplying 124 3 16 by 4, and dividing the product by 104, as is generally done, it is only necessary to divide the suttie by 26, which will give the same result. Thus, to find the tret of 124 3 16, I make the following division,

26)124 3 16(4 cwts. 3 qrs. 6 lbs. result

20

4

83

5

28

156

0

Ex. II.—*Required the tret of 28450 lbs.*

By stating the following proportion,

$$26 : 1 :: 28450 : x,$$

there is only one division to be made as follows:

26)28450(1094 result

245

110

6

N. B. 1 lb. more is allowed when the remainder of the division is or exceeds $\frac{1}{2}$.

OF COMMISSION, PREMIUMS OF INSURANCE, AND BROKERAGE.

Commission is a sum paid to merchants for buying, selling, paying, negotiating, claiming, remitting, or forwarding, any description of property or of merchandise.

A premium of insurance is a sum paid for causing any amount of goods to be insured, and for which the insurer assumes the dangers and risks to which the amount insured may be exposed.

Brokerage is a sum paid to intermediate agents between merchants for the purchase, sale, and negotiation ; and for claiming, receiving, insuring, or forwarding, any description of property or of merchandise.

These allowances are calculated by a rule of three, of which the first term is always 100, the second term the rate of allowance, and the third term the sum upon which the allowance is granted, while the fourth term of the proportion is the allowance to be made.

Ex. I.—*What is the commission on £834 15s 6d at $2\frac{1}{2}$ per cent?*

I state the following proportion, in which the fourth term is represented by x ,

$$100 : 2\frac{1}{2} :: 834 \text{ } 15 \text{ } 6 : x;$$

whence the following calculation:

834 15 6	1,00)20,86 18 9(20 17 4 result
$2\frac{1}{2}$	20
1669 11 0	17,38
for $\frac{1}{2}$ 417 7 9	12
2086 18 9	85
	38
	4,65

Ex. II.—*Required the insurance on £1083 at a premium of 4 guineas, that is, 4 pounds 4 shillings, per cent.*

100 : 4 4 :: 1083 : x	1,00)45,48 12(45 9 8 result
1083	20
4 4	
	9,72
4332	12
for 4 shillings 216 12	
	144
4548 12	72
	8,64

It is usual, among merchants, to cause insurances to be effected, so as to answer the purpose not only of securing the eventual repayment of the actual value insured, but also the premium of insurance itself and of the incidental charges. In fact, as in the case of a total loss the reimbursement of the sum insured is made under certain deductions, it is evident, that, to recover the whole, the sum to be insured should be greater in proportion as the deductions are more considerable.

The following calculation will shew how such determinable sum is ascertained.

Suppose an insurance at a premium of 10 guineas per cent upon £ s.
100 0

Deductions:

	£	s.
Amount of premium.....	10	10
Brokerage at $\frac{1}{2}$ per cent	0	10
Policy $\frac{1}{4}$ ditto	0	5
Charges of recovery $2\frac{1}{2}$ ditto	2	10
		13 15
		86 5

Thus, in case of recovery, as the assured will have already made a disbursement of the premium, &c. and as the charges of recovery will be a farther defalcation, it will be found that, of the £100 insured, not more than £86 5s will remain. Hence it is, that, in order to cover the principal and accessories, or the whole risk, of 840, it would be requisite to cause an insurance to be effected upon a sum which should contain 840 in the same manner as 100 contains 86 5. We should therefore state the following proportion,

$$86\ 5 : 100 :: 840 : x;$$

whence it is seen, that, to cover the risks of £840 at the premium of 10 guineas per cent, it is necessary that the insurance should be upon £974.

Ex. III.—What is the brokerage on £1536 8s 8d at $\frac{1}{8}$ per cent?

$$100 : \frac{1}{8} :: 1536\ 8\ 8 : x$$

$$1536\ 8\ 8$$

$$\frac{1}{8}$$

$$1,00)1,92\ 1\ 1(1\ 18\ 4\ \text{result}$$

$$20$$

$$18,41$$

$$12$$

$$83$$

$$41$$

$$4,93$$

The operations above mentioned are not susceptible of reduction, because the divisor, 100, is the most convenient, since, to divide by 100, it is only requisite, as it has been seen, to separate

by a comma the two last figures of the dividend, placing in the quotient the figures which are on the left of the comma.

OF INTEREST.

The advantages which a sum of money procures to the man who makes use of it, either in the operations of commerce, or in any productive work, are the greater, the oftener he can renew those operations, or the more he can increase such work. Hence it is, that a man who borrows a sum of money for his own use, must, when he returns it after a certain period, add a sum to the principal, in order to indemnify the lender for the advantages which he would have himself procured by the use of the same sum. Such is the idea to be entertained of the interest of money. In order to determine its application, we refer every sum to that of 100 pounds, taken as an unit, and agree as to the produce of the latter at the end of a year. This case has been foreseen by the legislature, and the rate of interest is fixed in England at 5 per cent per annum.

Ex.—What is the interest on £9125 for a year?

It will be perceived, that £9125 will contain the interest to be paid, as often as 100 contain 5; therefore, I state the following proportion, in which the fourth term is represented by x :

$$100 : 5 :: 9125 : x.$$

Upon examination of this proportion, I perceive that I may, without affecting it, reduce it to the following:

$$20 : 1 :: 9125 : x.$$

In fact, it is evident, that when £5 of interest are given for £100, one pound is given for twenty; and therefore there is, in the preceding proportion, only one division to be made.

20)9125(456 5 result

112

125

5

Now, if I wish to find the interest on £9125 for one day, I divide the quotient £456 5s, or the interest for a year, by 365, being the number of days contained in the year, as follows:

365)456 5(1 5 result

91

20

1825

0

It is obvious, that, after having obtained the interest for one day, if I wish to find that for any number of days, I have only to multiply the interest for one day by the given number of days. Thus, to find the interest on £9125 for 57 days, I multiply the quotient £1 5s, or the interest for 1 day, by 57.

$$\begin{array}{r}
 57 \\
 1\ 5 \\
 \hline
 57 \\
 \text{for 5 shillings} \quad 14\ 5 \\
 \hline
 71\ 5 \text{ result.}
 \end{array}$$

We find, therefore, that the interest on £9125 for 57 days, at the rate of 5 per cent per annum, is £71 5s.

To obtain, however, that interest, we have performed three operations, which, in business, are reduced to one: thus,

In the first operation, I divided £9125 by 20, which gave a quotient of £456 5s. In the second, I divided the same quotient 456 5 by 365, which gave £1 5s; but, it is evident, that, if I had divided £9125 at once by 7300, that is, by the product of the two divisors 20 and 365, I should have found the same result, £1 5s. In the third operation, I multiplied the quotient £1 5s by 57, which gave £71 5s.

If, however, instead of multiplying the quotient £1 5s by 57, I had multiplied the principal £9125 by 57, and divided the product by the aggregate divisor 7300, it is evident that I should have obtained, by that single operation, a result exactly similar to the ultimate result of the three operations; as follows:

$$\begin{array}{r}
 9125 \\
 57 \\
 \hline
 63875 \\
 45625 \\
 \hline
 520125
 \end{array}
 \qquad
 \begin{array}{r}
 7300)520125(71\ 5 \text{ result} \\
 9125 \\
 1825 \\
 20 \\
 \hline
 36500 \\
 0
 \end{array}$$

Hence I shall conclude, that, to calculate the interest upon a sum, for any number of days, at the rate of 5 per cent per annum, it is only requisite to state a proportion of which the first term be in every case 7300, and the second term the number of days for which interest is to be paid: thus, the third term, which is the sum given, will contain the interest to be paid, as often as 7300 may contain the number of days. For example, in the pre-

ceding instance, I should have stated the following proportion,

$$7300 : 57 :: 9125 : x.$$

Whence the following general rule : *to calculate interest, multiply the principal by the number of days, and divide the product by 7300.*

In order to facilitate the calculation of interest, if the sum be partly fractional, it is customary, when the number of shillings is or exceeds 10, to add an unit to the number of pounds ; and, on the other hand, when the number of shillings is less than 10, they are not included.

Interest in accounts current is calculated as follows : Multiply each item by the number of days ; place the product in the respective columns of interest, and divide the balance either to the debit or credit by 7300, agreeably with the following specimen :

ACCOUNT CURRENT *balanced to 31st December.*

Due.	Days.	Interest.	Sums.			Due.	Days.	Interest.	Sums.		
			£	s	d				£	s	d
13 Aug.	140	370860	2648	10	0	31 Aug.	122	976	8	0	0
18 Sept.	104	1872	18	1	0	5 Oct.	87	3915	45	3	9
2 Oct.	90	2880	31	19	7	10 Nov.	51	15606	305	10	10
26 Do.	66	16302	246	17	6	11 Dec.	20	48720	2436	9	11
16 Nov.	45	1485	33	0	0	Balance of Int.		324182			
		<u>393399</u>						<u>393399</u>			
Amount of Interest . .			44	8	2	Balance of Account . .			227	11	9
			<u>3022</u>	<u>16</u>	<u>3</u>				<u>3022</u>	<u>16</u>	<u>3</u>

Before I proceed, I shall observe, that in leap years, the first term of the proportion should be 7320, product of 20 by 366 days ; but it is usual to disregard the additional day, and always to divide by 7300.

Since, to calculate interest at 5 per cent per annum, we see that we should divide by the fixed number 7300, we may conclude that other fixed numbers may be obtained for similar calculations at other rates. In fact, if I had to calculate the interest of a sum at 4 per cent per annum, I should state the following proportion, in order to obtain a fixed number as a divisor by which I might facilitate my calculation :

$$4 : 5 :: 7300 : x.$$

Interest at 4 per cent being less than at 5, it is evident that the divisor in the former case must be greater than the divisor in the

latter; I have therefore placed 4, in the preceding proportion, as the first term, to obtain a divisor greater than 7300, and I find the fourth term of the proportion just mentioned to be 9125. Thus, to ascertain the interest on a sum at 4 per cent, it is only requisite to substitute the fixed number 9125 to the number 7300, that is, to divide by 9125. By means of this principle, and by following a similar method, other fixed divisors may be found.

At various periods, the excessive scarcity of the circulating medium, the exactions of lenders, and the urgent wants of borrowers, had given rise to the stipulation of an exorbitant interest, whence is dated the practice of usury. In order to repress such abuses, it has been determined by the legislature of every civilized country, that those obligations in which the interest should exceed certain limits should be considered usurious and void. It happens, however, not unfrequently, that critical circumstances and imperious necessity supersede the operation of the laws, and that interest is publicly paid at a rate beyond that which the laws permit. For instance, in *Holland*, where the legal interest is at 4 per cent per annum, it is not uncommon to see bills of exchange discounted at 6, 7, and 8 per cent, notwithstanding that this may have been often done at the moderate rate of 2 and $2\frac{1}{2}$.

In *France*, where the legal interest is at 5 per cent, it has been known to rise, in the course of the revolution, as high as 24 per cent per annum, and even more, while the present rate in business is generally from 6 to 9 per cent per annum.

In *Spain*, since the establishment of the Bank of San Carlos, bills of exchange are discounted at Madrid at $4\frac{1}{2}$ and at Cadiz at 5 per cent per annum; but the merchants generally charge 6 per cent.

In *Italy* and *Portugal* the interest is established at 6 per cent per annum; but it varies in those countries, as well as at *Hamburg*, according to commercial urgency, and the scarcity or abundance of cash.

Hence it is, that merchants, who purpose opening accounts current with others residing in other countries, have introduced the custom of fixing, previously, the rate of interest to be charged upon those sums of which the accounts just mentioned may consist. Such interest is settled in *England* at 5 per cent per annum, though it be occasionally at 6 in certain accounts with foreign merchants.

In order to facilitate the calculation of interest upon the Continent, it is generally agreed to consider the year as composed of only 360 days, that is, of 12 months composed of 30 days each, and it is upon this footing that a lender charges the interest upon his money; so that, reckoning the interest from the day of the advance to the day of repayment, the borrower pays, in fact, a small surplus, in the proportion of 360 to 365, or 366 if it be leap-year.

It follows, that in calculating interest in France, in Spain, in Italy, in Portugal, in Holland, and at Hamburg, at the rate of 5 per cent, they make use of 7200 as a divisor, being the product of 360 days by 20, instead of 7300, as in England. The former of these fixed divisors is more susceptible of furnishing a considerable number of other divisors; and, as the interest in the countries, or places, above mentioned is very subject to variation, it is much more convenient than the divisor 7300. Thus, if it were required to find a divisor appertaining to interest at 6 per cent, we should state the following proportion:

$$6 : 5 :: 7200 : x;$$

and by applying the same method to other rates of interest, in order to obtain their respective divisors, we should find the following:

At 2 per cent	-	-	18000	At 8 per cent	-	-	-	4500
3	-	-	12000	9	-	-	-	4000
4	-	-	9000	10	-	-	-	3600
6	-	-	6000	12	-	-	-	3000

And many others in similar proportions.

OF DISCOUNT.

Discount is a deduction from the amount of a bill of exchange, or of a debt, for a greater or less anticipation of payment.

The discount upon the amount of a bill is calculated in the same way as interest; that is, by multiplying the principal by the number of days, and dividing the product by the fixed number 7300, when the result is deducted from the amount of such bill.

The discount upon the amount of an anticipated payment is calculated like commission; that is, by multiplying the sum upon which the discount is allowed by the rate of discount, and dividing the product by 100, when the result is deducted from the payment to be made.

OF

Operations of Exchange.

EXCHANGES are of an universal use in commercial transactions with foreign countries ; since, in order to purchase and import goods, to sell and export the produce of our manufactures, it is absolutely necessary to know how to remit, or how to draw, and what is the equivalent between sterling and foreign money resulting from the course of exchange.

When an exchange is quoted between two places, one of these places always gives a price determined to receive an undetermined one. The determined price is called *certain*, because it is invariably the same : for example, London gives the certain price to France ; that is to say, one pound sterling to receive so many francs, more or less. The undetermined price is called *uncertain*, because it is always subject to variation : for instance, London gives the uncertain price to Spain ; that is to say, so many pence sterling, more or less, to receive a dollar of exchange.

Hence we may infer the two following principles. 1st, On a place to which London gives the certain price, a bill of exchange is to be drawn or negotiated at the lowest course, and to be taken at the highest.

For it is evident, that, if the exchange between London and Paris be at 24 francs per pound sterling, it will be more advantageous to a merchant at London to draw upon Paris at 23 than at 24, and to remit at 24 instead of 23 ; since, in drawing at 23, he will give only 23 francs to receive one pound, and in remitting at 24 he will receive 24 francs for the same value.

2dly, On a place to which London gives the uncertain price, a bill of exchange is to be drawn or negotiated at the highest course, and to be taken at the lowest.

In fact, if the exchange between London and Madrid be at 35 pence sterling per dollar of exchange, it will be more advantageous to a merchant at London to draw at 36 than at 35, and to

remit at 35 instead of 36; since, in drawing at 36, he will receive 36 pence for one dollar, and in remitting at 35 he will give only 35 pence to receive a dollar.

When bills are drawn at *usances*, the extent of such terms is determined by the custom of each place where the bills are payable.

Days of grace are a certain number of days granted for the payment of bills after the absolute term of payment is expired.

The word *agio* signifies the difference between bank money and current money: it also means, in those cities where foreign coins are current, the difference between the actual value of such coins and that at which they may have been fixed by the government.

Exchanges are either direct, indirect, or proportional. They are *direct*, when a place draws upon or remits to another, with which it has an exchange open; thus, when London draws upon or remits to Hamburg, the exchange is direct, since London has an exchange open with Hamburg.

Exchanges are *indirect*, when there is not any exchange established between two transacting places, and that the one is obliged, both in drawing upon, and in remitting to, the other, to make use of an intermediate place. For instance, London has not any exchange open with Vienna, and is consequently obliged, either in drawing or remitting to Vienna, to make use of Hamburg, or of some other intermediate place with which London has a direct exchange.

Exchanges are *proportional*, when they result from the comparison of known exchanges. For instance, if the exchange of London upon Lisbon and of Lisbon upon Hamburg were known, we should be able, by the comparison of those two exchanges, to find a third between London and Hamburg which would be in proportion to the two first; and it is for the purpose of ascertaining these proportional exchanges, that arbitrations of exchange have been invented.

There are two pars of exchange.

The first is the *intrinsic par*, resulting from the comparison of the weight, standard, and current value of the monies of one country with those of another. For instance, if we compare only the weight and standard of a foreign gold coin, such as the "*meya dobra*," with the sterling weight, standard, and value of a guinea, we find that the *meya dobra*, of which the value is fixed

in Portugal at 6400 reis, is equivalent with 36 shillings or 432 pence sterling; and it is this which is called the *par of coins*. Thus the par of coins being found, it is easy to deduce from it the par of exchange; for, to obtain that between London and Lisbon, it is only requisite to state the following proportion:

Foreign value	English value	Certain price
6400 reis	: 432 pence	: : 1000 reis : x

Whence it arises that the par of exchange between London and Lisbon resulting from the comparison of their respective gold coins is $67\frac{1}{2}$ pence sterling per milreis.

But, as it is known that the gold and silver coinage of most countries have not the same respective value, it follows that the proportion between gold and silver in one country is seldom the same as in another, and consequently that the par of exchange resulting from the comparison of the silver monies is almost always different from the par resulting from the comparison of the monies in gold; so that the intrinsic par is generally determined by the average result of the two other pars.

The second par may be called *eventual*.

It often happens that a place, instead of exchanging by cash, exchanges by an imaginary money. Thus, Amsterdam exchanges with London by florins banco; and, as there is a difference between bank money and current money which is determinable by the agio that may be quoted, it is evident, that, when this agio varies, the value of the florins banco also varies, and with it the par of exchange between Amsterdam and London. Again: governments are not unfrequently obliged by political events to create a paper currency of fictitious value, the circulation of which is more or less enforced, and consequently more or less extensive. For instance, in the course of last war the government of Portugal created a paper currency, "*papel moeda*," and ordered that half of every payment to be made in that kingdom should be in cash, and the remainder in paper money. This new combination of currency was entitled legal money, "*moeda legal*;" but, as it was partly fictitious, it could not long remain at the par of the former currency in cash; and hence, when the paper money is to be reduced into effective, a loss is incurred of a discount, more or less considerable, according to circumstances. When, therefore, the discount is at 10 per cent, there is a defalcation of 5 per

cent from the sum to be paid for a bill drawn from London upon Lisbon ; such payment being made in legal money. It is consequently evident that the par of $67\frac{1}{2}$, deduced from the above comparison of the gold coins, must vary in the same proportion as the discount on the paper money in question. We may therefore conclude, that we cannot accurately establish any commercial operations, or calculate *tables of arbitrations* upon the principle of the consideration of exchanges as *above or below par*.

There are several rules for the calculation of exchanges.

Let us select a simple operation which will be easily understood.

Proposition :—*Reduce 2400 francs into pounds sterling at the exchange of 24 francs per pound sterling.*

Calculation by the Rule of Proportion, or Rule of Three.—It will be perceived, that 24 francs and 1 pound become the two first terms of a direct and simple proportion, and that 2400 francs, which is the sum to be reduced, or the third term, will contain the fourth term of the proportion as often as 24 contain 1, that is, 24 times. Thus, by representing this fourth term by x , we have the following proportion,

$$24 \text{ francs} : 1 \text{ pound} :: 2400 \text{ francs} : x;$$

whence we must find the value of x , or the fourth term, by multiplying the two means by each other, and dividing their product by the first extreme : the result will be,

$$24 \text{ francs} : 1 \text{ pound} :: 2400 \text{ francs} : 100 \text{ pounds.}$$

In fact, the fourth term is of that proportionate value, since 100 are contained 24 times in 2400 : on the other hand, it is no less evident that these terms are in proportion to each other, since the product of the extremes is equal to the product of the means ;

Extremes	Means
for 24×100	$= 1 \times 2400$.

We shall hence conclude, that, in the calculation of an exchange by the rule of proportion, the third term is always the sum to be reduced, and the fourth term the sum given in exchange. In simple proportion, the first term is of the same kind as the third, and the second of the same kind as the fourth ; but in compound proportion the first of the first terms is of the same kind as the third, and the last of the second terms of the same kind as the fourth.

Calculation by the Rule of Equation.—We have just seen, that, by placing in equation the respective products of the extremes and of the means, the form of an equation may be given to every proportion: in fact, in order to verify, in the before mentioned proposition, that the product of the extremes was equal to the product of the means, we naturally proceeded to the following multiplications:

$$\begin{array}{r} 100 \quad 2400 \\ 24 \quad 1 \\ \hline 2400 \quad 2400 \end{array}$$

But as, in every proportion, we may always multiply the third term by the second, to divide the product by the first, representing the fourth term by x , it is evident that the proportion $24 : 1 :: 2400 : x$ may be thus stated:

$$24 : 1 :: 2400 : x$$

Now, if we consider that 24 francs are equivalent with 1 pound, since 24 francs are given in exchange for 1 pound, and that 2400 francs, which are the sum to be reduced, must be equivalent with x , since x represents the sum given in exchange, we shall perceive that we may substitute to the sign $:$, which indicates proportion, and means *is to*, that of $=$, which points out equation, and signifies *is equal*. By substituting such signs, we change the proportion into an equation, as follows:

$$\begin{array}{l} 2400 \text{ francs} = x \\ 24 \text{ francs} = 1 \text{ pound;} \end{array}$$

which is called, in mathematics, *to substitute to proportions their corresponding equations*.

If calculations of exchange were confined to simple and direct rules of proportion, it would be quite unnecessary to use the mode of substitution; but as these operations are often very complicated, I have myself always adopted the mode in question, in order to simplify the operations by comprising the three first terms of the proportions in two columns, of which one becomes the dividend and the other the divisor. It may be also observed, that, by this means, a habit will be acquired of stating the rule of equation, upon which all the calculations of business are founded.

Let us now proceed to a more difficult operation.

Proposition:—*Reduce 4081 florins 4 stivers banco into pounds sterling, at the exchange of 38 shillings Flemish banco per pound sterling.*

In this operation, there are three sorts of money; that is, florins banco, pounds sterling, and shillings Flemish banco. The shillings Flemish are an imaginary money used at Amsterdam and Hamburg in exchanges, and in the purchase of certain goods. Thus, as Amsterdam exchanges with London by this money, it is, in the first place, necessary to reduce the florins banco into shillings Flemish, and afterwards the shillings Flemish into pounds sterling.

We have already seen that the sum to be reduced is constantly the third term of the proportion, which, in the corresponding equation, becomes the first term of the dividend: therefore, in order to resolve the preceding proposition, and beginning the formation of the column of the dividend by the sum to be reduced, that is, by 4081 4, I place on the right its equivalent represented by x , in the following manner:

$$4081\ 4 = x.$$

Then I observe that the first term of the proportion, or the first term of the divisor, must always be of the same kind as the third term of the proportion, that is, as the first term of the dividend: thus, as the first term of the dividend is in florins, I conclude that the first term of the divisor must also be composed of florins; but as those florins are to be reduced into shillings Flemish, I refer to the table of Amsterdam for the proportion between these two monies, and find that 3 florins are equivalent with 10 shillings Flemish; wherefore I place 3 florins as the first term of the divisor, at the same time that I place its equivalent as the second term of the dividend, in the following manner:

$$4081\ 4 = x$$

$$3\ \text{florins} = 10\ \text{shillings Flemish}.$$

It is evident, that, by the mere position of these two numbers 3 and 10, I have reduced the florins into shillings Flemish, since, if we were to multiply 4081 4 by 10, and divide the product 40812 by 3, we should find the result to be 13604 shillings Flemish, and this would in fact be the process which might be followed; but it would, in this case, be indispensable to make another operation to reduce 13604 shillings Flemish into pounds sterling:

in order, therefore, to abridge, the two operations are united into one, whence is derived the term of *rule of conjunction*, which I have thought it inexpedient to adopt, as my calculations are founded upon the theory of equations.

Proceeding, therefore, and having shillings Flemish to reduce into pounds sterling, the exchange itself points out to me that 38 shillings Flemish are equivalent with 1 pound sterling: hence, I place 38 as the second term of the divisor, and 1 as the third term of the dividend, in the following manner:

$$\begin{array}{rcl} & & 4081 \ 4 = x \\ 3 \text{ florins} & = & 10 \text{ shillings Flemish} \\ 38 \text{ shill. Flem.} & = & 1 \text{ pound sterling.} \end{array}$$

In fact, it is evident that 38 should be placed in the column of the divisor, since, if I had made the two operations separately, I should have divided the result of the first, that is, 13604, by 38, which would have given a second result of 358, or the same which we are about to obtain, by a single operation.

In compound proportion, the last of the second terms being always of the same kind as the fourth, I perceive, that, in the above equation, 1 pound sterling, which is the last of the second terms of the proportion, or the last term of the dividend of the equation, is of the same kind as the fourth term of the proportion, or the result of the equation; that is, as the sum to be given in exchange: on the other hand, the object of the operation being to reduce florins banco into pounds sterling, as I have obtained 1 pound sterling for the last term of the dividend, I conclude that I have not any thing farther to do than to make the operations as stated, that is, to multiply all the terms of the divisor by each other, to multiply in the same manner all the terms of the dividend by each other, and to divide the product of the second column by the product of the first, when the quotient will be the amount of the sum given in exchange.

Realizing, therefore, these operations, I find the result to be 358; demonstrating, that, if I take a bill of exchange upon Amsterdam for 4081 florins 4 stivers banco, at the exchange of 38 shillings Flemish banco for 1 pound sterling, I must pay 358 pounds sterling. Thus, the value of x being found, I have consequently the following equation:

$$\begin{array}{rcl} & & 4081 \ 4 = 358 \\ 3 & = & 10 \\ 38 & = & 1 \end{array}$$

Now, if I wish to verify the accuracy of the operation, that is to say, to ascertain whether the product of the extremes be equal to the product of the means, I see that the dividend comprises the means; and therefore I transfer 358, which was the unknown extreme, to the divisor comprising the terms of the known extreme, and, multiplying the terms of both columns by each other, I find that the operation is correct, since the products are equal.

$$\begin{array}{r}
 358 \qquad 4081 \ 4 \\
 3 \qquad 10 \\
 38 \qquad 1 \\
 \hline
 40812 = 40812
 \end{array}$$

This operation may also be proved in another manner by an inverse operation.

In fact, since by the reduction of 4081 florins 4 stivers banco into pounds sterling at the exchange of 38 shillings Flemish we have obtained for result 358 pounds, we must necessarily reproduce the former sum by reducing 358 pounds sterling into florins and stivers banco at the same exchange; whence, if we had had to reduce 358 pounds sterling into florins and stivers banco, it would have been necessary to have placed 358 as the first term of the dividend; and, by following the same reasoning, and making the same operations, the result would have been the following equation:

$$\begin{array}{r}
 358 = 4081 \ 4 \\
 1 \text{ pound sterling} = 38 \text{ shillings Flemish} \\
 10 \text{ shill. Flemish} = 3 \text{ florins banco,} \\
 \text{and, by transposing such result, the products would have been found to be equal,} \\
 \begin{array}{r}
 4081 \ 4 \qquad 358 \\
 1 \qquad 38 \\
 10 \qquad 3 \\
 \hline
 40812 = 40812
 \end{array}
 \end{array}$$

The proceedings observed in the two propositions above mentioned, being founded upon principles which are applicable to every case of the same nature, lead to this general rule.

To find the Equation.—Always place the sum to be reduced as the first term of the dividend. Let each term of the divisor be of the same kind as the term immediately preceding in the dividend, and place opposite to each its equivalent. Observe that the last term of the dividend must always be of the same kind as the sum given in exchange.

To resolve the Equation.—Multiply all the terms of the dividend and all the terms of the divisor by each other respectively, and divide the first product by the second.

To prove the Equation.—Verify whether the product of the divisor by the result of the equation be equal to the product of the dividend ; or, state an inverse equation, of which the result must be equal to the first term of the dividend of the former equation.—Agreeably with these general principles, I have placed, after each proposition, the equation resulting from its examination ; and it is from such equations that I have deduced the rule to be followed for the solution of each operation.

OF FIXED NUMBERS.

Fixed numbers, which will be occasionally mentioned, are formed in three ways.

1st, By the product of the multiplication of two or more numbers, which always appertain to certain operations, and are therefore invariable in those operations.—See *Hamburg on France, &c.*

2dly, By the result of a similar multiplication after the suppression of two equivalent numbers from each of the members of the equation.—See *Augsburg on Hamburg, &c.*

3dly, By the result of an exact division of invariable numbers.—See *Sicily on Naples.*

COMMERCIAL APPLICATION OF FRACTIONS.

The object of mathematics is that of considering every sort of calculation under general points of view, and consequently of furnishing rules applicable to every case ; but it oftens happens in practice, that particular rules, more applicable to certain operations, and tending to abridge them, are substituted to the general rules of the science. Hence it is, that familiarity with the particular rules effaces, after a time, the recollection of the general rules, notwithstanding that the latter be occasionally necessary to solve those problems which are not within the compass of the particular rules which have succeeded them.

The truth of this assertion is principally observable in fractional calculations. In the treatises upon arithmetic, general rules are given for the different operations of which fractions are susceptible ; but, in practice, those rules are more or less modified, and very different methods have even been adopted for the multiplica-

tion and division of fractional numbers. The prevalence of the methods alluded to has been such, that the general rules may be said to have been totally forgotten; whence it arises, that, in calculations involving any fractional numbers to which the rules of practice are not applicable, considerable embarrassment is sometimes experienced.

The principal object in the composition of this part of my work being that of facilitating the calculation of exchanges in accounting houses, I have adopted, in the solution of those operations, the methods of which I have spoken; and, in order to point out how much they differ from the general rules, I shall give two examples of the respective calculations.

MULTIPLICATION OF FRACTIONAL NUMBERS.

Required to multiply £567 12s 6d by $46\frac{1}{4}$.

By the general rule we should proceed as follows:

1st, Reduce each of the whole numbers into a fraction of the same denomination as the lowest fractional part annexed to the whole numbers; that is, $46\frac{1}{4}$ into fourths, and £567 12s 6d into pence, to be taken as the numerator of a fraction of which 240, or the number of pence in a pound, would be the denominator.

2dly, Multiply the numerators and the denominators by each other respectively.

3dly, Divide the product of the numerators by the product of the denominators; the whole according to the following example:

$$46\frac{1}{4} = \frac{185}{4}; 567 \ 12 \ 6 = \frac{136230}{240}$$

$$\frac{185}{4} \times \frac{136230}{240} = \frac{25202550}{960}$$

$$\frac{25202550}{960} = £26252 \ 13s \ 1\frac{1}{2}d \text{ result.}$$

To this operation by the general rule, which is evidently long and tedious, the following is substituted:

	567 12 6
	<u>46$\frac{1}{4}$</u>
	3402
	2268
for $\frac{1}{4}$	141 15
for $\frac{1}{2}$	23 2 6
for $\frac{1}{8}$	5 15 7 $\frac{1}{2}$
	<u>£26252 13s 1$\frac{1}{2}$d result.</u>

In this operation, I have first inter-multiplied the whole numbers. I have then taken a proportional part of the whole numbers of the multiplicand for the fraction $\frac{1}{4}$, that is, a fourth; and as the fraction 12 6 is equivalent with $\frac{5}{8}$ of a pound, I have taken for $\frac{4}{8}$ or $\frac{1}{2}$ a proportional part of the multiplier, that is, the half of $46\frac{1}{4}$, and, for the remaining $\frac{1}{8}$, another proportional part, that is, an eighth of $46\frac{1}{4}$, or the fourth of the half obtained for $\frac{4}{8}$.

OF DIVISION OF FRACTIONAL NUMBERS.

Required to divide £26252 13s 1½d by 46¼.

By adopting the general rule, it is expedient,

1st, To reduce each of the whole numbers into a fraction of the same denomination as the lowest of the fractional parts annexed to the whole numbers, that is, $46\frac{1}{4}$ into fourths, and £26252 13s 1½d into half-pence, to be taken as the numerator of a fraction of which 480, or the number of half-pence in a pound, will be the denominator.

2dly, To reverse the dividing fraction.

3dly, To inter-multiply the numerators and the denominators respectively.

4thly, To divide the product of the numerators by the product of the denominators; the whole as follows:

$$46\frac{1}{4} = \frac{185}{4}; \quad £26252 \ 13s \ 1\frac{1}{2}d = \frac{12601275}{480}$$

$$\frac{4}{185} \times \frac{12601275}{480} = \frac{50405100}{88800}$$

$$\frac{50405100}{88800} = £567 \ 12s \ 6d \text{ result.}$$

To the foregoing operation the following is substituted:

$46\frac{1}{4}$	$26252 \ 13 \ 1\frac{1}{2}$
$\frac{4}{185}$ fraction	$\frac{12601275}{480}$ fraction
185 divisor	185)105010 12 6(567 12 6 result
	1251
	1410
	115
	20
	2312
	462
	92
	12
	190
	92
	1110
	0

This calculation is performed by removing the denominator of the fraction annexed to the divisor, which is effected by multiplying the divisor and the dividend by the denominator of that fraction, and by adding to the product of the divisor the numerator of the same fraction. In respect to the division, the operation is upon the same principle as that which is explained in the calculation of tare, under the head of *Different Calculations*.

Hence we may conclude, that, for the multiplication of numbers partly fractional, we must take parts of the whole numbers proportional to the fractions annexed to them; and that for the division of fractional numbers it is only requisite to remove the denominator of the fraction annexed to the divisor. If, after such operation, there should be a fraction annexed to the whole numbers of the dividend, it is simply necessary to add that fraction to the product of the remainder of the division by the several subdivisions of unity. When the operations proposed cannot be performed with facility by the rules of practice in question, recourse should then be had to the general rules.

LONDON.

Monies of Exchange and Regulations.

A pound = 20 shillings, or 240 pence.

A shilling = 12 pence, or 48 farthings.

Accounts are kept in pounds, shillings, and pence: some reckon farthings.

Value of usances for bills drawn from

France, Hamburg, and Holland	1 month after date.
Portugal and Spain	2 months after date.
Italy	3 months after date.

There are three days of grace, which begin the day after the bills are due, and on the third day they must be paid or protested. Bills due on Sunday must be paid or protested on Saturday: for those at sight, no days of grace are allowed.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>	<i>Time.</i>
Amsterdam	...giv...37 shillings Flemish	...for...1 pound sterling	...3 months
Idem	...giv...12 florins current	...for...1 pound sterling	...ditto
Dublin	...giv...110½ pounds Irish	...for...100 pounds British	...21 days sight
France	...giv...25 francs	...for...1 pound sterling	...3 months
Genoa	...rec...46 pence sterling	...for...1 pezza fuori di banco	...ditto
Hamburg	...giv...35 shillings Flemish	...for...1 pound sterling	...ditto
Leghorn	...rec...50 pence sterling	...for...1 pezza of 8 reals	...ditto
Naples	...rec...39 pence sterling	...for...1 ducat di regno	...ditto
Portugal	...rec...63½ pence sterling	...for...milreis	...60 days date
Rotterdam	...giv...12 florins current	...for...1 pound sterling	...3 months
Antwerp	...giv...12 florins current	...for...1 pound sterling	...ditto
Spain	...rec...36 pence sterling	...for...1 dollar of exchange	...ditto
Venice	...giv...58 lire piccole	...for...1 pound sterling	...ditto

N. B. For the Operation of Exchange between London and Antwerp, see London on Rotterdam, page 30.

LONDON ON AMSTERDAM.

Reduce 4086 florins 4 stivers 6 penings banco into pounds, shillings, and pence sterling, at the exchange of 38 shillings 2 grotes Flemish banco per pound sterling.

Equation. $4086\ 4\ 6 = x$

1 florin	=	40 grotes
12 grotes	=	1 shilling
38 shill. 2 grotes	=	1 pound.

Rule.—Multiply 4086 4 6 by 40 grotes; divide the product by 38 2, price of exchange, and by 12 grotes.

38 2	4086 4 6	458)163448	$\frac{1}{4}$ (356 17 6 result
12	40	2604	
		3148	
		400	
458 div.	163440	20	
for 4 stivers	8	8015	
for 6 penings	$\frac{3}{4}$	3435	
	163448 $\frac{3}{4}$	229	
		12	
		458	
		229	
		2748	
		0	

See the proof of this operation, page 32.

N. B. When the price of exchange consists of shillings Flemish only, multiply the sum by 10 instead of 40, and multiply the price of exchange by 3 instead of 12.

LONDON ON DUBLIN.

Reduce 293 pounds 10 shillings 6 pence Irish into pounds, shillings, and pence British, at the exchange of 14 per cent.

Equation. $293\ 10\ 6 = x$

$\text{£}114\ \text{Irish} = \text{£}100\ \text{British}.$

Rule.—Multiply 293 10 6 by 100, and divide the product by 114, price of exchange.

293 10 6	114)29352 10	(257 9 6 result
100	655	
	852	
	54	
29300	20	
for 10 shillings	50	1090
for 6 pence	2 10	64
	12	
29352 10	128	
	64	
	768	
	84	

To prove this operation, that is, to calculate the exchange of Dublin on London, multiply 257 9 6 by 114, price of exchange, and divide the product by 100.

N. B. British money is $8\frac{1}{3}$ per cent better than the Irish; therefore 12 pounds British = 13 pounds Irish.

LONDON ON FRANCE.

Reduce 2545 francs 41 cents into pounds, shillings, and pence sterling, at the exchange of 24 francs 80 cents per pound sterling.

Equation. $2545\ 41 = x$

24 francs 80 cents = 1 pound.

Rule.—Divide 2545 41 by 24 80, price of exchange.

2480)254541(102 12 9 result

6541

1581

20

31620

6820

1860

12

3720

1860

22320

0

See the proof of this operation, page 55.

LONDON ON GENOA.

Reduce 1277 pezze 13 soldi 4 denari fuori di banco into pounds, shillings, and pence sterling, at the exchange of 45 pence sterling per pezza of 115 soldi fuori di banco.

Equation. $1277\ 13\ 4 = x$

1 pezza = 45 pence

240 pence = 1 pound.

Rule.—Multiply 1277 13 4 by 45, price of exchange, and divide the product by 240 pence.

1277 13 4

45

6385

5108

for 10 soldi - 22 10

for 3 do. 4 denari 7 10

12)57495

20) 4791 3

239 11 3 result.

See the proof of this operation, page 65.

LONDON ON HAMBURG.

Reduce 1416 marcs 1 shilling 6 fenings lubs banco into pounds, shillings, and pence sterling, at the exchange of 35 shillings 4 grotes Flemish banco per pound sterling.

Equation.

$$\begin{aligned} 1416 \ 1 \ 6 &= x \\ 1 \text{ marc} &= 32 \text{ grotes} \\ 12 \text{ grotes} &= 1 \text{ shilling} \\ 35 \text{ shill. 4 grot.} &= 1 \text{ pound} \end{aligned}$$

Rule.—Multiply 1416 1 6 by 32 grotes; divide the product by 35 4, price of exchange, and by 12 grotes.

35 4	1416 1 6	424)45315	(106 17 6 result
12	32	2915	
—	—	371	
424 div.	2832	20	
	4248	—	
for 1 shilling -	2	7420	
for 6 fenings -	1	3180	
	—	212	
	45315	12	
		—	
		424	
		212	
		—	
		2544	
		0	

See the proof of this operation, page 71.

N. B. When the price of exchange consists of shillings Flemish only, multiply the sum by 8 instead of 32, and multiply the price of exchange by 3 instead of 12.

LONDON ON LEGHORN.

Reduce 664 pezze 7 soldi 6 denari of 8 reals into pounds, shillings, and pence sterling, at the exchange of 48 pence sterling per pezza of 8 reals.

Equation.

$$\begin{aligned} 664 \ 7 \ 6 &= x \\ 1 \text{ pezza} &= 48 \text{ pence} \\ 240 \text{ pence} &= 1 \text{ pound.} \end{aligned}$$

Rule.—Multiply 664 7 6 by 48, price of exchange, and divide the product by 240 pence.

664 7 6	12)31890
48	—
—	20) 2657 6
5312	—
2656	122 17 6 result.
for 5 soldi - -	12
for 2 do. 6 den.	6
—	
31890	

See the proof of this operation, page 76.

LONDON ON NAPLES.

Reduce 1014 ducats 16 grains di regno into pounds, shillings, and pence sterling, at the exchange of $37\frac{1}{2}$ pence sterling per ducat di regno.

Equation.

$$1014 \text{ } 16 = x$$

$$1 \text{ ducat} = 37\frac{1}{2} \text{ pence}$$

$$240 \text{ pence} = 1 \text{ pound.}$$

Rule.—Multiply 1014 16 by $37\frac{1}{2}$, price of exchange, and divide the product by 240 pence.

$$\begin{array}{r} 1014 \text{ } 16 \\ 37\frac{1}{2} \\ \hline 7098 \\ 3042 \\ \text{for } \frac{1}{2} \dots\dots\dots 507 \\ \text{for } 16 \text{ grains}\dots\dots 6 \\ \hline 12)38031 \\ \hline 20) 3169 \text{ } 3 \\ \hline 158 \text{ } 9 \text{ } 3 \text{ result.} \end{array}$$

See the proof of this operation, page 86.

LONDON ON PORTUGAL.

Reduce 566880 reis into pounds, shillings, and pence sterling, at the exchange of $62\frac{1}{2}$ pence per mil reis.

Equation.

$$566880 = x$$

$$1000 \text{ reis} = 62\frac{1}{2} \text{ pence}$$

$$240 \text{ pence} = 1 \text{ pound.}$$

Rule.—Multiply 566880 by $62\frac{1}{2}$, price of exchange; divide the product by 1000 reis, and the quotient by 240 pence.

$$\begin{array}{r} 566880 \quad 1,000)35430,000 \\ 62\frac{1}{2} \\ \hline 1133760 \\ 3401280 \\ \text{for } \frac{1}{2} \dots\dots\dots 283440 \\ \hline 35430000 \end{array} \quad \begin{array}{r} 12)35430 \\ \hline 20)2952 \text{ } 6 \\ \hline 147 \text{ } 12 \text{ } 6 \text{ result.} \end{array}$$

See the proof of this operation, page 90.

N. B. To divide the product by 1000, separate the three right hand figures; and when they are or exceed 500, add 1 unit.

LONDON ON ROTTERDAM OR ANTWERP.

Reduce 2401 florins 17 stivers 8 penings current into pounds, shillings, and pence sterling, at the exchange of 12 florins 4 stivers current per pound sterling.

Equation.

$$2401 \ 17 \ 8 = x$$

$$12 \text{ florins } 4 \text{ stivers} = 1 \text{ pound.}$$

Rule.—Divide 2401 17 8 by 12 4, price of exchange.

12 4	2401 17 8
20 fraction	20 fraction
244 div.	244)48037½(196 17 6 result.
	2363
	1677
	218
	20
	4270
	1830
	122
	12
	244
	122
	1464
	0

See the proof of this operation, page 33.

LONDON ON SPAIN.

Reduce 2643 dollars 6 reals 17 maravedis of plate into pounds, shillings, and pence sterling, at the exchange of 35½ pence sterling per dollar of exchange.

Equation.

$$2643 \ 6 \ 17 = x$$

$$1 \text{ dollar} = 35½ \text{ pence}$$

$$240 \text{ pence} = 1 \text{ pound.}$$

Rule.—Multiply 2643 6 17 by 35½, price of exchange, and divide the product by 240 pence.

	2643 6 17
	35½
	13215
	7929
for ½.....	1321 4
for 4 reals.....	17 6
for 2 ditto.....	8 7
for 17 maravedis...	2 1 25½
	12)93855 2 25½
	20) 7821 3
	391 1 3 result.

See the proof of this operation, p. 102.

LONDON ON VENICE.

Reduce 14783 lire 3 soldi 9 denari piccole into pounds, shillings, and pence sterling, at the exchange of 59 lire piccole effective per pound sterling.

Equation.

$$14783 \ 3 \ 9 = x$$

$$59 \text{ lire} = 1 \text{ pound.}$$

Rule.—Divide 14783 3 9 by 59, price of exchange.

$$59 \overline{) 14783 \ 3 \ 9} (250 \ 11 \ 3 \text{ result.}$$

298

33

20

663

73

14

12

37

14

177

0

See the proof of this operation, page 119.

AMSTERDAM AND HOLLAND.

Monies of Exchange, and Regulations.

A rixdollar (*Rixdalter*) = $2\frac{1}{2}$ florins = 50 stivers = $8\frac{1}{3}$ shillings Flemish or 100 grotes Flemish.

A florin or guilder (*Gulden*) = 20 stivers = $3\frac{1}{3}$ shillings Flemish or 40 grotes Flemish.

A stiver (*Stuyver*) = 16 penings or 2 grotes Flemish.

A pound Flemish (*Pond Flaams*) = 20 shillings Flemish = 240 grotes Flemish or 6 florins.

A shilling Flemish (*Schilling Flaams*) = 12 grotes Flemish or 6 stivers.

A grote Flemish (*Groot Flaams*) = $\frac{1}{2}$ stiver or 8 penings.

2 rixdollars = 5 florins.

3 rixdollars = 25 shillings Flemish.

3 florins = 10 shillings Flemish.

Accounts are kept in florins, stivers, and penings.

Value of usances for bills drawn from

England and France 1 month after date.

Italy, Portugal, and Spain 2 months after date.

Dantzic and Konigsberg 40 a 70 days after date.

Germany and Switzerland 14 days after sight.

There are 6 days of grace, Sundays and holidays included, for bills of exchange drawn in current money; but for those drawn in bank money, no days of grace are generally allowed, and bills are protested on the second or third day after they become due.

OF OPERATIONS OF EXCHANGE.
AMSTERDAM AND HOLLAND.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	rec.....37 shillings Flemish.....	for...1 pound sterling.
Idem	rec.....12 florins current.....	for...1 pound sterling.
Breslaw	rec.....44 stivers banco	for...1 libra banco.
Dantzic	rec.....1 pound Flemish.....	for...372 groshen current.
France	rec.....54 grotes Flemish	for...3 francs.
Francfort	giv.....139 rixdollars	for...100 rixdollars current.
Geneva	rec.....90 grotes Flemish	for...1 crown current.
Genoa	rec.....83 grotes Flemish	for...1 pezza fuori di banco.
Hamburg	rec.....33 stivers banco	for...1 marc lubs banco.
Idem	rec.....106 florins current	for...120 marcs lubs banco.
Leghorn	rec.....88 grotes Flemish	for...1 pezza of 8 reals.
Portugal	rec.....44 grotes Flemish	for...1 crusade of 400 reis.
Spain	rec.....89 grotes Flemish	for...1 ducat of exchange.
Venice	giv.....4 lire 18 soldi	for...1 florin banco.
Vienna	rec.....25 stivers banco	for...1 rixdollar current.

AMSTERDAM ON LONDON.

Reduce 356 pounds 17 shillings 6 pence sterling into florins, stivers, and penings banco, at the exchange of 38 shillings 2 grotes Flemish banco per pound sterling.

Equation.

	356 17 6 = x
1 pound =	38 shill. 2 grotes
1 shilling =	12 grotes
40 grotes =	1 florin.

Rule.—Multiply 356 17 6 by 38 2, price of exchange, and by 12 grotes; divide the product by 40 grotes.

	356 17 6	40)163448	15(4086 4 6 result.
38 2 × 12 =	458	344	
		248	
	2848	8	
	1780	20	
	1424		
for 10 shillings....	229	175	
for 5 ditto.....	114 10	15	
for 2 do. 6 pence..	57 5	16	
	163448 15	90	
		15	
		240	
		0	

See the proof of this operation, page 26.

N. B. When the price of exchange consists of shillings Flemish only, multiply the price of exchange by 3 instead of 12, and divide the product by 10 instead of 40.

AMSTERDAM AND ROTTERDAM ON LONDON.

Reduce 196 pounds 17 shillings 6 pence sterling into florins, stivers, and penings current, at the exchange of 12 florins 4 stivers current per pound sterling.

Equation. $196\ 17\ 6 = x$
 $1\ \text{pound} = 12\ \text{florins}\ 4\ \text{stivers}.$

Rule.—Multiply 196 17 6 by 12 4, price of exchange.

$$\begin{array}{r}
 196\ 17\ 6 \\
 12\ 4 \\
 \hline
 392 \\
 196 \\
 \hline
 \text{for 4 stivers} \dots\dots 39\ 4 \\
 \text{for 10 shillings} \dots\dots 6\ 2 \\
 \text{for 5 ditto} \dots\dots 3\ 1 \\
 \text{for 2 do. 6 pence} \dots\dots 1\ 10\ 8 \\
 \hline
 \end{array}$$

2401 17 8 result.

See the proof of this operation, page 30.

AMSTERDAM ON FRANCE.

Reduce 1056 francs 75 cents into florins, stivers, and penings banco, at the exchange of 54 grotes Flemish banco for 3 francs.

Equation. $1056\ 75 = x$
 $3\ \text{francs} = 54\ \text{grotes}$
 $40\ \text{grotes} = 1\ \text{florin}.$

Rule.—Multiply 1056 75 by 54, price of exchange, and divide the product by 120, fixed number.

$$\begin{array}{r}
 1056\ 75 \quad 120 \overline{) 57064\frac{1}{2}} \quad (475\ 10\ 12\ \text{result} \\
 54 \\
 \hline
 4224 \\
 5280 \\
 \hline
 \text{for 50 cents} \dots\dots 27 \\
 \text{for 25 cents} \dots\dots 13\frac{1}{2} \\
 \hline
 57064\frac{1}{2} \\
 \hline
 906 \\
 664 \\
 64 \\
 20 \\
 \hline
 1290 \\
 90 \\
 16 \\
 \hline
 540 \\
 90 \\
 \hline
 1440 \\
 240 \\
 0
 \end{array}$$

See the proof of this operation, page 55.

AMSTERDAM ON GENOA.

Reduce 572 pezze fuori di banco into florins and stivers banco, at the exchange of 85 grotes Flemish banco per pezza of 115 soldi fuori di banco.

Equation.

$$\begin{aligned} 572 &= x \\ 1 \text{ pezza} &= 85 \text{ grotes} \\ 40 \text{ grotes} &= 1 \text{ florin.} \end{aligned}$$

Rule.—Multiply 572 by 85 grotes, and divide the product by 40 grotes.

572	40)48620(1215 10 result
85	86
—	62
2860	220
4576	20
—	20
48620	400
	0

See the proof of this operation, page 65.

AMSTERDAM ON HAMBURG.

Reduce 3746 marcs 5 shillings 4 fenings lubs banco into florins, stivers, and penings banco, at the exchange of $34\frac{1}{2}$ stivers banco for 2 marcs lubs banco.

Equation.

$$\begin{aligned} 3746 \ 5 \ 4 &= x \\ 2 \text{ marcs} &= 34\frac{1}{2} \text{ stivers} \\ 20 \text{ stivers} &= 1 \text{ florin.} \end{aligned}$$

Rule.—Multiply 3746 5 4 by $34\frac{1}{2}$, price of exchange, and divide the product by 40, fixed number.

3746 5 4	40)1292481(3231 4 4 result
341 $\frac{1}{2}$	92
—	124
14984	48
11238	8
for $\frac{1}{2}$ 1873	20
for 4 shillings . 8 10	—
for 1 shilling . 2 2 6	170
for 4 fenings . 11 6	10
—	16
1292481	160
	0

See the proof of this operation, page 71.

AMSTERDAM ON HAMBURG.

Reduce 2854 marcs 8 shillings lubs banco into florins, stivers, and penings current, at the exchange of 106 florins current for 120 marcs lubs banco.

Equation. $2854\ 8 = x$

120 marcs = 106 florins.

Rule.—Multiply 2854 8 by 106, price of exchange, and divide the product by 120 marcs.

2854 8	120)302577(2521 9 8 result.
106	625
17124	257
28540	177
for 8 shillings.... 53	57
	20
302577	1140
	60
	16
	960
	0

See the proof of this operation, page 72.

AMSTERDAM ON LEGHORN.

Reduce 675 pezze 17 soldi 6 denari of 8 reals into florins, stivers, and penings banco, at the exchange of 88 grotes Flemish banco per pezza of 8 reals.

Equation. $675\ 17\ 6 = x$

1 pezza = 88 grotes

40 grotes = 1 florin.

Rule.—Multiply 675 17 6 by 88, price of exchange, and divide the product by 40 grotes.

675 17 6	40)59477(1486 18 8 result.
88	194
5400	347
5400	277
for 10 soldi 44	37
for 5 ditto 22	20
for 2 do. 6 den. 11	740
59477	340
	20
	16
	320
	0

See the proof of this operation, page 77.

AMSTERDAM ON PORTUGAL:

Reduce 669 crusades 200 reis into florins, stivers, and penings banco, at the exchange of 45 grotes Flemish banco per crusade of 400 reis.

Equation.

$$669\ 200 = x$$

$$1\text{ crusade} = 45\text{ grotes}$$

$$40\text{ grotes} = 1\text{ florin.}$$

Rule.—Multiply 669 200 by 45, price of exchange, and divide the product by 40 grotes.

669 200	40)30127½(753 3 12 result
45	212
—	127
3345	7
2676	20
for 200 reis..... 22½	—
30127½	150
	30
	16
	—
	480
	80
	0

See the proof of this operation, page 91.

AMSTERDAM ON SPAIN.

Reduce 350 ducats 17 sueldos 6 dineros of exchange into florins, stivers, and penings banco, at the exchange of 88 grotes Flemish banco per ducat of exchange.

Equation.

$$350\ 17\ 6 = x$$

$$1\text{ ducat} = 88\text{ grotes}$$

$$40\text{ grotes} = 1\text{ florin.}$$

Rule.—Multiply 350 17 6 by 88, price of exchange, and divide the product by 40 grotes.

350 17 6	40)30877(771 18 6 result
88	287
—	77
2800	37
2800	20
for 10 sueldos..... 44	—
for 5 ditto..... 22	740
for 2 do. 6 dineros 11	340
—	20
30877	12
	—
	240
	0

To prove this operation, multiply 771 18 6 by 40 grotes, and divide the product by 88, price of exchange.

AMSTERDAM ON VIENNA.

Reduce 784 guldens 30 cruitzers into florins, stivers, and penings banco, at the exchange of $25\frac{1}{2}$ stivers banco per rixdollar.

Equation.

$$\begin{aligned} 784 \text{ } 30 &= x \\ 1\frac{1}{2} \text{ gulden} &= 1 \text{ rixdollar} \\ 1 \text{ rixdollar} &= 25\frac{1}{2} \text{ stivers} \\ 20 \text{ stivers} &= 1 \text{ florin.} \end{aligned}$$

Rule.—Multiply 784 30 by $25\frac{1}{2}$, price of exchange, and divide the product by 30, fixed number.

784 30	30)	20004 $\frac{3}{4}$	(666 16 8 result.
25 $\frac{1}{2}$		200	
3920		204	
1568		24	
392		20	
12 $\frac{3}{4}$		495	
20004 $\frac{3}{4}$		195	
		15	
		16	
		90	
		15	
		240	
		0	

See the proof of this operation, page 124.

AMSTERDAM AND HOLLAND.

Reduction of florins banco into florins current.

Reduce 4596 florins 17 stivers 8 penings banco into florins, stivers, and penings current, at the agio of $4\frac{1}{2}$ per cent.

Equation.

$$\begin{aligned} 4596 \text{ } 17 \text{ } 8 &= x \\ 100 \text{ florins banco} &= 104\frac{1}{2} \text{ florins current.} \end{aligned}$$

Rule.—Multiply 4596 17 8 by $104\frac{1}{2}$, rate of the agio, and divide the product by 100.

4596 17 8	1,00)	4803,73 8 12	(4803 14 11 result
104 $\frac{1}{2}$		20	
18384		14,68	
45960		16	
2298		420	
52 5		68	
26 2 8		11,00	
13 1 4			
480373 8 12			

See the proof of this operation in the following page.

AMSTERDAM AND HOLLAND.

Reduction of florins current into florins banco.

Reduce 4803 florins 14 stivers 11 penings current into florins, stivers, and penings banco, at the agio of $4\frac{1}{2}$ per cent.

Equation.

$$4803 \ 14 \ 11 = x$$

$$104\frac{1}{2} \text{ florins current} = 100 \text{ florins banco.}$$

Rule.—Multiply 4803 14 11 by 100, and divide the product by $104\frac{1}{2}$, rate of the agio.

$104\frac{1}{2}$	4803 14 11	209)960746 17 8	(4596 17 8 result
2 fraction	100	1247	
		2024	
209 div.	480300	1436	
for 10 stivers	50	182	
for 4 ditto	20	20	
for 11 penings	3 8 12		
	480373 8 12	3657	
	2 fraction	1567	
		104	
		16	
	960746 17 8	632	
		104	
		1672	
		0	

See the proof of this operation in the preceding page.

ANTWERP AND FLANDERS.

Monies of Exchange, and Regulations.

A rixdollar = $2\frac{2}{3}$ florins = 48 patars = 8 shillings Flemish or 96 grotes Flemish.

A florin = 20 patars = $3\frac{1}{3}$ shillings Flemish or 40 grotes Flemish.

A patar or stiver = 16 penings or 2 grotes Flemish.

A pound Flemish = 20 shillings or 240 grotes Flemish.

A shilling Flemish = 6 patars or 12 grotes Flemish.

A grote Flemish = $\frac{1}{2}$ patar or 8 penings.

5 rixdollars = 12 florins

3 florins = 10 shillings Flemish.

Exchange money is $16\frac{2}{3}$ per cent better than current money; therefore,

6 florins of exchange = 7 florins current.

Accounts are kept in florins, patars, and penings.

The value of usances is the same as at Amsterdam, and there are 6 days of grace, Sundays and holidays included.

ANTWERP AND FLANDERS.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices</i>
London	rec.....37 shillings Flemish.....	for...1 pound sterling.
France	rec.....francs.....	for...francs at a discount.
Hamburg	rec.....36½ patars.....	for...2 marcs lubs banco.
Holland.....	giv.....99 florins banco	for...100 florins of exchange.
Portugal	rec.....45 grotes Flemish	for...1 crusade of 400 reis.
Spain.....	rec.....89 grotes Flemish	for...1 ducat of exchange.

N. B. Antwerp exchanges by exchange money.

ANTWERP AND FLANDERS ON LONDON.

Reduce 145 pounds 10 shillings sterling into florins, patars, and penings of exchange, at the exchange of 38 shillings 2 grotes Flemish per pound sterling.

Equation.

$$\begin{aligned}
 145 \text{ } 10 &= x \\
 1 \text{ pound} &= 38 \text{ shillings } 2 \text{ grotes} \\
 1 \text{ shilling} &= 12 \text{ grotes} \\
 40 \text{ grotes} &= 1 \text{ florin.}
 \end{aligned}$$

Rule.—Multiply 145 10 by 38 2, price of exchange, and by 12 grotes; divide the product by 40 grotes.

$$\begin{array}{r}
 145 \text{ } 10 \quad 40)66639(1665 \text{ } 19 \text{ } 8 \text{ result} \\
 38 \text{ } 2 \times 12 = 458 \quad 266 \\
 \hline
 1160 \quad 263 \\
 725 \quad 239 \\
 580 \quad 39 \\
 \hline
 \text{for 10 shillings.. } 229 \quad 20 \\
 \hline
 66639 \quad 780 \\
 \hline
 \quad 380 \\
 \quad 20 \\
 \quad 16 \\
 \hline
 \quad 320 \\
 \quad 0
 \end{array}$$

To prove this operation, multiply 1665 19 8 by 40 grotes; divide the product by 38 2, price of exchange, and by 12 grotes.

N. B. For the calculation of other operations, see Amsterdam.

AUGSBURG.

Monies of Exchange, and Regulations.

A rixdollar (*thaler*) = $1\frac{1}{2}$ gulden or 90 cruitzers.

A gulden = 60 cruitzers or 240 fenings.

There is exchange money and current money.

100 rixdollars of exchange = 127 rixdollars current

200 ditto = 381 guldens current

2 rixdollars current.... = 3 guldens current.

Accounts are kept in guldens and cruitzers.

The value of usance is 15 days after acceptance.

Payments are made only every Wednesday, and there is 1 day of grace for bills due on Tuesdays, while there are 8 for those due on Wednesdays.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

London	rec.....	$9\frac{3}{4}$ guldens.....	for.....	1 pound sterling.
Amsterdam.....	rec.....	115 rixd. exchange	for.....	100 rixdollars banco.
France.....	rec.....	120 guldens	for.....	300 francs.
Genoa.....	giv.....	62 soldi fuori di banco...	for.....	1 gulden.
Hamburg	rec.....	118 rixd. exchange.....	for.....	100 rixdollars banco.
Leghorn	giv.....	57 soldi buona moneta...	for.....	1 gulden.
Vienna	giv.....	128 guldens.....	for.....	100 guldens.

AUGSBURG ON LONDON.

Reduce 126 pounds 12 shillings 6 pence sterling into guldens and cruitzers current, at the exchange of 9 guldens 45 cruitzers current per pound sterling.

Equation.

$$126 \ 12 \ 6 = x$$

$$1 \text{ pound} = 9 \text{ guldens } 45 \text{ cruitzers.}$$

Rule.—Multiply 126 12 6 by 9 45, price of exchange.

$$\begin{array}{r} 126 \ 12 \ 6 \\ 9 \ 45 \\ \hline \end{array}$$

1134

for 30 cruitzers..... 63

for 15 ditto..... 81 30

for 10 shillings..... 4 52 $\frac{1}{2}$

for 2 do. 6 pence ... 1 13 $\frac{1}{8}$

1234 35 $\frac{5}{8}$ result.

To prove this operation, divide 1234 35 by 9 45, price of exchange.

AUGSBURG ON AMSTERDAM.

Reduce 785 florins banco into guldens and cruitzers current, at the exchange of 112 rixdollars of exchange for 100 rixdollars banco.

Equation. $785 = x$

5 florins.....	=	2 rixdollars banco
100 rixdollars banco	=	112 rixdollars of exchange
100 rixdollars of exch.	=	127 rixdollars current
2 rixdollars current	=	3 guldens current.

Rule.—Multiply 785 by 112, price of exchange, and by 381; divide the product by 50000, fixed number.

785	5,0000)3349,7520(669 57 result
112	34
—	49
1570	47520
785	60
785	—
—	285,1200
87920	35
381	0
—	
87920	
703360	
263760	
—	
33497520	

To prove this operation, multiply 669 57 by 50000, fixed number; divide the product by 381, and by 112, price of exchange.

AUGSBURG ON FRANCE.

Reduce 3738 francs into guldens and cruitzers current, at the exchange of 124 guldens current for 300 francs.

Equation. $3738 \ 17 \ 6 = x$

300 francs	=	124 guldens.
------------	---	--------------

Rule.—Multiply 3738 by 124, price of exchange, and divide the product by 300 francs.

3738
124
—

14952

7476

3738
—

3,00)4635,12(1545 12 result.

To prove this operation, multiply 1545 by 300 francs, and divide the product by 124, price of exchange.

AUGSBURG ON HAMBURG.

Reduce 546 marcs lubs banco into guldens and cruitzers current, at the exchange of 120 rixdollars of exchange for 100 rixdollars banco.

Equation.

$$\begin{aligned}
 546 &= x \\
 3 \text{ marcs banco} &= 1 \text{ rixdollar banco} \\
 100 \text{ rixdollars banco} &= 120 \text{ rixdollars of exchange} \\
 100 \text{ rixdollars of exch.} &= 127 \text{ rixdollars current} \\
 2 \text{ rixdollars current} &= 3 \text{ guldens current.}
 \end{aligned}$$

Rule.—Multiply 546 by 120, price of exchange, and by 127 rixdollars current; divide the product by 20000, fixed number.

$$\begin{array}{r}
 546 \\
 120 \\
 \hline
 10920 \\
 546 \\
 \hline
 65520 \\
 127 \\
 \hline
 458640 \\
 131040 \\
 65520 \\
 \hline
 2,0000)832,1040(416 \text{ 3 result} \\
 60 \\
 \hline
 6,2400
 \end{array}$$

To prove this operation, multiply 416 3 by 20000, fixed number; divide the product by 127 rixdollars current, and by 120, price of exchange.

BERLIN AND BRESLAW.

Monies of Exchange, and Regulations.

$$\begin{aligned}
 \text{A pound banco} &= 24 \text{ groshen banco or 30 good groshen} \\
 \text{A groshen banco} &= 12 \text{ fenings banco} \\
 \text{A Frederic} &= 5 \text{ rixdollars current} \\
 \text{A rixdollar current} &= 24 \text{ good groshen} \\
 \text{A good groshen} &= 12 \text{ fenings} \\
 \text{4 pounds banco} &= 5 \text{ rixdollars current.}
 \end{aligned}$$

Accounts are kept in rixdollars, good groshen, and fenings current; and in pounds, groshen, and fenings banco.

The value of usance is 14 days after acceptance. 3 days of grace are allowed at Berlin, inclusive of Sundays and holidays, and 6 at Breslaw.

N. B. Bills of exchange above 100 rixdollars must be paid in bank money.

BERLIN AND BRESLAW.

Course of Exchange.

IN BANCO.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	giv.....48 pence sterling	for.....1 pound banco.
Amsterdam	giv.....43 stivers banco	for.....1 do. do.
France	giv.....5 francs	for.....1 do. do.
Francfort.....	giv.....119 cruitzers	for.....1 do. do.
Hamburg	giv.....40 shillings lubs banco	for.....1 do. do.
Vienna	giv.....148 cruitzers	for.....1 do. do.

IN CURRENT.

London	rec.....6½ rixdollars current	for.....1 pound sterling.
Amsterdam	rec.....144 rixdollars current	for.....100 rixdollars banco.
France	rec.....77 rixdollars current	for.....300 francs.
Francfort	rec.....98 rixdollars current	for.....100 rixdollars
Hamburg	rec.....149 rixdollars current	for.....100 rixdollars banco
Vienna	rec.....78 rixdollars current	for.....100 rixdollars.

N. B. For the calculation of operations in current money, see
Leipsic.

BERLIN ON LONDON.

Reduce 345 pounds 8 shillings 5 pence sterling into pounds, groshen, and fenings banco, at the exchange of $49\frac{1}{2}$ pence sterling per pound banco.

Equation.

$$345\ 8\ 5 = x$$

$$1\ \text{pound} = 240\ \text{pence}$$

$$49\frac{1}{2}\ \text{pence} = 1\ \text{pound.}$$

Rule.—Reduce 345 8 5 into pence, and divide the product by $49\frac{1}{2}$, price of exchange.

49½	345 8 5	99)165802(1674 18 5 result
2 fraction	20	668
—	—	740
99 div.	6908	472
	12	76
	—	24
	13821	—
	6908	304
	—	152
	82901	—
	2 fraction	1824
	—	834
	165802	42
		12
		—
		84
		42
		—
		504
		9

To prove this operation, multiply 1674 18 5 by $49\frac{1}{2}$, price of exchange, and divide the product by 240 pence.

BERLIN ON AMSTERDAM.

Reduce 2587 florins 10 stivers banco into pounds and groshen banco, at the exchange of 44 stivers banco per pound banco.

Equation. $2587\ 10 = x$
 $1\ \text{florin} = 20\ \text{stivers}$
 $44\ \text{stivers} = 1\ \text{pound}.$

Rule.—Multiply 2587 10 by 20 stivers, and divide the product by 44, price of exchange.

2587 10	44)51750(1176 3 result
20	77
—	335
51750	270
	6
	24
	—
	144
	12

To prov this operation, multiply 1176 3 by 44, price of exchange, and divide the product by 20 stivers.

BERLIN ON HAMBURG.

Reduce 2648 marcs 12 shillings lubs banco into pounds and groshen banco, at the exchange of 41 shillings lubs banco per pound banco.

Equation. $2648\ 12 = x$
 $1\ \text{marc} = 16\ \text{shillings}$
 $41\ \text{shillings} = 1\ \text{pound}.$

Rule.—Multiply 2468 12 by 16 shillings, and divide the product by 41, price of exchange.

2648 12	41)42380(1033 15 result
16	138
—	150
15900	27
2648	24
—	—
42380	108
	54
	—
	648
	238
	33

To prove this operation, multiply 1033 15 by 41, price of exchange, and divide the product by 16 shillings.

BOLOGNA.

Monies of Exchange.

A lira = 20 soldi or 240 denari

A soldo = 12 denari

A scudo di cambio .. = 85 soldi

4 scudi di cambio .. = 17 lire.

Accounts are kept in lire, soldi, and denari.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

Amsterdam	rec.....	41 soldi	for.....	1 florin banco.
France	rec.....	56 soldi	for.....	3 francs.
Genoa	rec.....	92 soldi	for.....	6 lire fuori di banco.
Leghorn	rec.....	89 soldi	for.....	1 pezza of 8 reals.
Milan	rec.....	85 soldi	for.....	6 lire current.
Idem	rec.....	119 soldi	for.....	1 crown.
Naples	rec.....	78 soldi	for.....	1 ducat di regno.
Rome	rec.....	97 soldi	for.....	1 crown current.
Vienna	rec.....	29 soldi	for.....	1 gulden.

BREMEN.

Monies of Exchange, and Regulations.

A rixdollar = $2\frac{1}{2}$ marcs = 48 shillings or 72 grotes.

Accounts are kept in rixdollars and grotes.

The value of usance for bills drawn from London is 1 month after date, and from Germany 15 days after sight.

8 days of grace are allowed.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

Amsterdam	rec.....	134 rixdollars	for.....	100 rixdollars banco.
Augsburg	rec.....	98 ditto	for.....	100 rixdollars current.
France	rec.....	75 ditto	for.....	300 francs.
Frankfort	rec.....	110 ditto	for.....	100 rixdollars current.
Hamburg	rec.....	142 ditto	for.....	100 rixdollars banco.
London	rec.....	605 ditto	for.....	100 pounds sterling.

BREMEN ON LONDON.

Reduce 373 pounds 17 shillings 6 pence sterling into rixdollars and grotes, at the exchange of 604 rixdollars for 100 pounds sterling.

Equation. $373\ 17\ 6 = x$

100 pounds = 604 rixdollars.

Rule.—Multiply 373 17 6 by 604, price of exchange, and divide the product by 100 pounds.

373 17 6	1,00)	2258,20½	(2258 14 result.
604		72	
1492		1440	
22880		36	
for 10 shillings.....	302		
for 5 ditto.....	151	14,76	
for 2 do. 6 pence	75½		
	225820½		

To prove this operation, multiply 2258 14 by 100 pounds, and divide the product by 604, price of exchange.

COLOGNE.

Monies of Exchange, and Regulations.

A rixdollar specie = 80 albus.

A rixdollar current = 78 albus.

An albus = 2 cruitzers or 8 hellers.

A cruitzer = 4 hellers or 6 fenings.

Accounts are kept in rixdollars and albus.

The value of usance is 14 days after acceptance, and there are 6 days of grace for bills drawn at usance.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
Amsterdam .....rec.....	145 rixdollars current	for.....100 rixdollars banco.
Antwerp .....rec.....	138 rixdollars specie	for.....100 rixdollars.
Augsburg .....giv.....	99 rixdollars current	for.....100 rixdollars current.
France .....rec.....	78 rixdollars current	for.....300 francs.
Leipsic .....rec.....	101 rixdollars specie	for.....100 rixdollars.

CONSTANTINOPLE AND SMYRNA.

Monies of Exchange.

A piastre = 40 paras or 120 aspers.

A para = 3 aspers.

Accounts are kept either in piastres and paras, in piastres and half paras, or in piastres and cents.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London.....	rec.....18 piastres.....	for.....1 pound sterling.
Amsterdam	rec.....59 paras.....	for.....1 florin current.
France	giv.....1½ franc.....	for.....1 piastre.
Genoa	giv.....24½ soldi fuori di banco ...	for.....1 piastre.
Leghorn	rec.....144 paras	for.....1 pezza of 8 reals.
Naples	rec.....116 paras	for.....1 ducat di regno.
Vienna	rec.....57 paras.....	for.....1 gulden.

CONSTANTINOPLE ON LONDON.

Reduce 256 pounds 7 shillings 6 pence sterling into piastres and paras, at the exchange of $17\frac{1}{2}$ piastres per pound sterling.

Equation. $256\ 7\ 6 = x$
 $1\ \text{pound} = 17\frac{1}{2}$

Rule.—Multiply 256 7 6 by $17\frac{1}{2}$, price of exchange.

$$\begin{array}{r}
 256\ 7\ 6 \\
 \times 17\frac{1}{2} \\
 \hline
 1792 \\
 256 \\
 \hline
 \text{for } \frac{1}{2} \dots\dots\dots 128 \\
 \text{for } \frac{1}{4} \dots\dots\dots 4\ 15 \\
 \text{for } \frac{1}{8} \dots\dots\dots 2\ 7\frac{1}{2} \\
 \hline
 \end{array}$$

4486 $22\frac{1}{2}$ result.

To prove this operation, divide 4486 $22\frac{1}{2}$ by $17\frac{1}{2}$, price of exchange.

CONSTANTINOPLE ON AMSTERDAM.

Reduce 2480 florins 17 stivers 8 penings current into piastres and paras, at the exchange of 62 paras for 1 florin current.

Equation.

$$2480 \ 17 \ 8 = x$$

$$\begin{aligned} 1 \text{ florin} &= 62 \text{ paras} \\ 40 \text{ paras} &= 1 \text{ piastre.} \end{aligned}$$

Rule.—Multiply 2480 17 8 by 62, price of exchange, and divide the product by 40 paras.

2480 17 8	40)	153814 10	(3845 14 result
62		338	
		181	
4960		214	
14880		14	
for $\frac{1}{2}$	31	40	
for $\frac{1}{4}$	15 20	—	
for $\frac{1}{8}$	7 30	570	
	—	170	
153814 10		10	

To prove this operation, multiply 3845 14 by 40 paras, and divide the product by 62, price of exchange.

CONSTANTINOPLE ON GENOA.

Reduce 3634 lire 10 soldi fuori di banco into piastres and paras, at the exchange of $24\frac{1}{2}$ soldi fuori di banco per piastre.

Equation.

$$3634 \ 10 = x$$

$$\begin{aligned} 1 \text{ lira} &= 20 \text{ soldi} \\ 24\frac{1}{2} \text{ soldi} &= 1 \text{ piastre.} \end{aligned}$$

Rule.—Multiply 3634 10 by 20 soldi, and divide the product by $24\frac{1}{2}$ soldi, price of exchange.

$24\frac{1}{2}$	3634 10	49)	145380	(2966 37 result
2 fraction	20		473	
	—		328	
49 div.	72690		340	
	2 fraction		46	
	—		40	
	145380		1840	
			370	
			27	

To prove this operation, multiply 2966 37 by $24\frac{1}{2}$, price of exchange, and divide by 20 soldi.

CONSTANTINOPLE ON LEGHORN.

Reduce 840 pezze 12 soldi 6 denari of 8 reals into piastres and paras, at the exchange of 148 paras per pezza of 8 reals.

Equation. $840\ 12\ 6 = x$

1 pezza = 148 paras

40 paras = 1 piastre.

Rule.—Multiply 840 12 6 by 148, price of exchange, and divide the product by 40 paras.

	840 12 6	40)124412 20	(3110 12 result
	148		44
	6720		41
	3360		12
	840		40
for $\frac{1}{2}$	74		500
for $\frac{1}{8}$	18 20		100
			20
	124412 20		

To prove this operation, multiply 3110 12 by 40 paras, and divide the product by 148, price of exchange.

COPENHAGEN AND DENMARK.

Monies of Exchange, and Regulations.

A rixdollar = 3 marcs lubs = 6 marcs Danish or 96 skillings Danish.

A marc Danish = 8 shillings lubs or 16 skillings Danish.

A skilling Danish = 6 fenings lubs or 12 fenings Danish.

Accounts are kept in rixdollars, skillings, and fenings Danish.

The value of usance is not fixed.

There are 8 days of grace, which are not allowed for bills at sight.

Course of Exchange.

	Uncertain Prices.	Certain Prices.
London.....rec.....	6 rixdollars	for...1 pound sterling.
Amsterdam.....rec.....	129 rixdollars	for...100 rixdollars current.
Dantzic.....rec.....	88 rixdollars	for...100 rixdollars.
France.....rec.....	72 rixdollars	for...300 francs.
Hamburg.....rec.....	146 rixdollars	for...100 rixdollars banco.

COPENHAGEN ON LONDON.

Reduce 232 pounds 15 shillings 6 pence sterling into rixdollars, skillings, and fenings Danish, at the exchange of 6 rixdollars 8 skillings per pound sterling.

Equation. $232\ 15\ 6 = x$

1 pound = 6 8.

Rule.—Multiply 232 15 6 by 6 8, price of exchange.

	232	15	6
	6	8	
	1392		
for 8 skillings	19	32	
for 10 skillings	3	4	
for 5 ditto....	1	50	
for 6 pence ..	14	7½	

1416 4 7½ result.

To prove this operation, divide 1416 4 7½ by 6 8, price of exchange.

COPENHAGEN ON AMSTERDAM.

Reduce 6834 florins current into rixdollars, skillings, and fenings Danish, at the exchange of 128 rixdollars Danish for 100 rixdollars current.

Equation.

$6834 = x$

2½ florins = 1 rixdollar

100 rixdollars = 128 rixdollars Danish.

Rule.—Multiply 6834 by 128, price of exchange, and divide the product by 250, fixed number.

6834	250	874752	(3499 0 9 result
128		1247	
		2475	
54672		2252	
13668		2	
6834		96	
874752		192	
		12	
		384	
		192	
		2304	
		54	

To prove this operation, multiply 3499 0 9 by 250, fixed number, and divide the product by 128, price of exchange.

COPENHAGEN ON HAMBURG.

Reduce 2547 marcs lubs banco into rixdollars, skillings, and fenings Danish, at the exchange of 142 rixdollars Danish for 100 rixdollars banco.

Equation.

$$\begin{aligned} 2547 &= x \\ 3 \text{ marcs} &= 1 \text{ rixdollar} \\ 100 \text{ rixdollars} &= 142 \text{ rixdollars Danish.} \end{aligned}$$

Rule.—Multiply 2547 by 142, price of exchange, and divide the product by 300, fixed number.

2547	300)361674(1205 55 8 result
142	616
—	1674
5094	174
10188	96
2547	—
—	1044
361674	1566
	—
	16704
	1704
	204
	12
	—
	408
	204
	—
	2448
	48

To prove this operation, multiply 1205 55 8 by 300, fixed number, and divide the product by 142, price of exchange.

DANTZIC AND KONIGSBERG.

Monies of Exchange, and Regulations.

A rixdollar (*Thaler*) = 3 florins or 90 groshen.

A florin (*Gulden*) = 30 groshen.

The above-mentioned monies are in currency of Little Poland, which is of double the value of that of Great Poland.

Accounts are kept in florins and groshen current.

The value of usance is 14 days after acceptance.

There are 10 days of grace, which are not allowed for bills at sight.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London.....	rec.....24 florins current	for.....1 pound sterling.
Amsterdam	rec.....372 groshen ditto	for.....1 pound Flemish.
France	giv.....4 francs	for.....1 rixdollar current.
Francfort	rec.....105 groshen current	for.....1 rixdollar.
Hamburg	rec.....169 groshen current	for.....1 rixdollar banco.
Leipsic	giv.....94 rixdollars	for.....100 rixdollars.

DANTZIC ON LONDON.

Reduce 532 pounds 17 shillings 6 pence sterling into florins current, at the exchange of 24 florins current per pound sterling.

Equation.

$$532\ 17\ 6 = x$$

$$1\ \text{pound} = 24\ \text{florins.}$$

Rule.—Multiply 532 17 6 by 24, price of exchange.

$$\begin{array}{r} 532\ 17\ 6 \\ 24 \\ \hline 2128 \\ 1064 \\ \hline \text{for 10 shillings...} \quad 12 \\ \text{for 5 ditto.....} \quad 6 \\ \text{for 2 ditto 6 pence} \quad 3 \\ \hline \end{array}$$

12789 result.

To prove this operation, divide 12789 by 24, price of exchange.

DANTZIC ON AMSTERDAM

Reduce 4686 florins 10 stivers banco into florins and groshen current, at the exchange of 372 groshen current per pound Flemish.

Equation.

$$4686\ 10 = x$$

$$6\ \text{florins} = 1\ \text{pound Flemish}$$

$$1\ \text{pound} = 372\ \text{groshen}$$

$$30\ \text{groshen} = 1\ \text{florin.}$$

Rule.—Multiply 4686 10 by 372, price of exchange, and divide the product by 180, fixed number.

$$\begin{array}{r} 4686\ 10\ 180)1743378(9685\ 13\ \text{result} \\ 372 \quad 1233 \\ \hline 9372 \quad 1537 \\ 32802 \quad 978 \\ 14058 \quad 78 \\ \hline \text{for 10 stivers..} \quad 186 \quad 30 \\ \hline 1743378 \quad 2340 \\ 540 \\ 0 \end{array}$$

To prove this operation, multiply 9685 13 by 180, fixed number, and divide the product by 372, price of exchange.

DANTZIC ON HAMBURG.

Reduce 896 marcs 12 shillings lubs banco into florins and groshen current, at the exchange of 168 groshen per rixdollar banco.

Equation.

$$\begin{aligned} 896 \text{ } 12 &= x \\ 3 \text{ marcs} &= 1 \text{ rixdollar} \\ 1 \text{ rixdollar} &= 168 \text{ groshen} \\ 30 \text{ groshen} &= 1 \text{ florin.} \end{aligned}$$

Rule.—Multiply 896 12 by 168, price of exchange, and divide the product by 90, fixed number.

896 12	90)	150654	(1673 28 result
168		606	
		665	
7168		354	
5376		84	
896		30	
for 8 shillings.....	84		
for 4 ditto	42	2520	
		720	
		0	
150654			

To prove this operation, multiply 1673 28 by 90, fixed number, and divide the product by 168, price of exchange.

FLORENCE.

Monies of Exchange.

A scudo d'oro	=	20 soldi d'oro or 7 lire 10 soldi.
A soldo d'oro	=	12 denari d'oro.
A ducat or piastra	=	20 soldi = 240 denari or 7 lire.
A francescono	=	10 paoli or $6\frac{2}{3}$ lire.
A pezza of 8 reals	=	20 soldi = 240 denari or $5\frac{1}{2}$ lire.
14 scudi	=	15 ducats.
23 scudi	=	30 pezze.

Accounts are kept in scudi, soldi, and denari d'oro; and in ducats, soldi, and denari.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
Amsterdam	giv.....90 grotes Flemish.....	for.....1 pezza of 8 reals
Bologna.....	giv.....87 soldi	for.....1 do. do.
France	giv.....5 francs	for.....1 do. do.
Genoa	giv.....126 soldi fuori di banco.....	for.....1 do. do.
Leghorn	rec.....117 soldi	for.....1 do. do.
Milan.....	giv.....126 soldi current	for.....1 do. do.
Naples	giv.....114 ducats di regno	for.....100 pezze do.
Rome.....	rec.....102 francesconi	for.....105 crowns current.
Vienna	rec.....47 soldi	for.....1 gulden.

FRANCE.

Monies of Exchange, and Regulations.

A livre tournois = 20 sols or 240 deniers.

A sol tournois = 12 deniers.

A franc is divided into 100 cents, and is $1\frac{1}{4}$ per cent better than a livre tournois; that is to say, 100 francs are equal to $101\frac{1}{4}$ livres.

A franc is also divided by merchants into 20 sols.

80 francs = 81 livres.

Accounts are kept in francs and cents.

Value of usances for bills drawn from

Portugal and Spain.....60 days after date.

London and other countries.30 days after date.

There are 10 days of grace; but bills drawn at sight, or at a fixed term, must be paid or protested after they are due.—No days of grace are allowed at Lyons.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

London	rec.....	24 francs 10 cents	for...	1 pound sterling.
Amsterdam	giv.....	55 grotes Flemish	for...	3 francs.
Augsburg.....	rec.....	2 francs 60 cents	for...	1 gulden current.
Berlin	rec.....	4 francs 80 cents	for...	1 pound banco.
Idem.....	giv.....	78 rixdollars	for...	300 francs.
Constantinople	rec.....	3 francs 10 cents	for...	1 piastre.
Copenhagen	giv.....	67 rixdollars	for...	500 francs.
Dantzic	rec.....	3 francs 65 cents	for...	1 rixdollar current.
Francfort.....	giv.....	76 rixdollars current	...for...	300 francs.
Genoa	rec.....	4 francs 76 cents	for...	1 pezza fuori di banco.
Hamburg.....	rec.....	189 francs 24 cents	for...	100 marcs lubs banco.
Idem.....	giv.....	25 shillings banco	for...	3 francs.
Leghorn	rec.....	5 francs 25 cents	for...	1 pezza of 8 reals.
Leipsic.....	giv.....	77 rixdollars	for...	300 francs.
Lisbon	giv.....	470 reis	for...	3 francs.
Milan	giv.....	$7\frac{1}{2}$ lire current	for...	6 francs.
Naples	rec.....	4 francs 38 cents	for...	1 ducat di regno.
Petersburg	rec.....	3 francs 40 cents	for...	1 rouble.
Rome	rec.....	5 francs 20 cents	for...	1 crown current.
Sicily	giv.....	47 grains	for...	1 franc.
Spain	rec.....	14 francs 90 cents	for...	1 pistole of exchange.
Idem.....	rec.....	3 francs 80 cents	for...	1 dollar of exchange.
Stockholm	giv.....	$25\frac{1}{2}$ skillings	for...	3 francs.
Venice	giv.....	$2\frac{1}{4}$ lire piccole	for...	1 franc.
Vienna.....	rec.....	2 francs 5 cents	for...	1 gulden.

FRANCE ON LONDON.

Reduce 102 pounds 12 shillings 9 pence sterling into francs and cents, at the exchange of 24 francs 80 cents per pound sterling.

Equation. $102\ 12\ 9 = x$
 $1\ \text{pound} = 24\ \text{francs}\ 80\ \text{cents}.$

Rule.—Multiply 102 12 9 by 24 80, price of exchange.

	102 12 9	
	24 80	
	—	
	408	
	204	
for 80 cents.....	81 60	
for 10 shillings.....	12 40	
for 2 ditto.....	2 48	
for 9 pence.....	93	
	—	

2545 41 result.

See the proof of this operation, page 27.

To reduce francs and cents into livres, sols, and deniers tournois, multiply the sum by 81, and divide the product by 80.

FRANCE ON AMSTERDAM.

Reduce 475 florins 10 stivers 12 penings banco into francs and cents, at the exchange of 54 grotes Flemish banco for 3 francs.

Equation. $475\ 10\ 12 = x.$
 $1\ \text{florin} = 40\ \text{grotes}.$
 $54\ \text{grotes} = 3\ \text{francs}.$

Rule.—Multiply 475 10 12 by 120, fixed number, and divide the product by 54, price of exchange.

	475 10 12	54	57064½	(1056 75 result
	120		306	
	—		364	
	9500		40	
	475		100	
for 10 stivers.....	60		—	
for 8 penings.....	3		4050	
for 4 ditto.....	1½		270	
	—		0	
	57064½			

See the proof of this operation, page 33.

FRANCE ON GENOA.

Reduce 240 pezze 7 soldi 6 denari fuori di banco into francs and cents, at the exchange of 96 sols in francs per pezza of 115 soldi fuori di banco.

Equation.

$$240\ 7\ 6 = x$$

$$1\text{ pezza} = 96\text{ sols}$$

$$20\text{ sols} = 1\text{ franc.}$$

Rule.—Multiply 240 7 6 by 96, price of exchange, and divide the product by 20 sols.

	240	7	6	20)	23076	(1153	80	result
	96					30		
						107		
	1440					76		
	2160					16		
for 5 soldi.....	24					100		
for 2 do. 6 den.....	12							
						1600		
	23076					00		

See the proof of this operation, page 66.

FRANCE ON HAMBURG.

Reduce 412 marcs lubs banco into francs and cents, at the exchange of 196 francs for 100 marcs lubs banco.

Equation.

$$412 = x$$

$$100\text{ marcs} = 196\text{ francs.}$$

Rule.—Multiply 412 by 196, price of exchange, and divide the product by 100 marcs.

412
196
—
2472
3708
412
—

100)80752(807 52 result.

To prove this operation, multiply 807 52 by 100 marcs, and divide the product by 196, price of exchange.

FRANCE ON HAMBURG.

Reduce 1466 marcs 6 shillings 1 fenning lubs banco into francs and cents, at the exchange of $25\frac{1}{2}$ shillings lubs banco for 3 francs.

Equation.

$$1466 \ 6 \ 1 = x$$

$$1 \text{ marc} = 16 \text{ shillings}$$

$$25\frac{1}{2} \text{ shillings} = 3 \text{ francs.}$$

Rule.—Multiply 1466 6 1 by 48, fixed number, and divide the product by $25\frac{1}{2}$, price of exchange.

$25\frac{1}{2}$	1466 6 1	51)	140772 $\frac{1}{2}$	(2760 24 result
2 fraction	48		387	
			307	
51 div.	11728		12	
	5864		100	
for 4 shillings....	12			
for 2 ditto.....	6		1250	
for 1 fenning.....	$\frac{1}{4}$		230	
			26	
	70386 $\frac{1}{4}$			
	2 fraction			
	140772 $\frac{1}{2}$			

See the proof of this operation, page 72.

FRANCE ON LEGHORN.

Reduce 760 pezze 7 soldi 6 denari of 8 reals into francs and cents, at the exchange of 104 sols in francs per pezza of 8 reals.

Equation.

$$760 \ 7 \ 6 = x$$

$$1 \text{ pezza} = 104 \text{ sols}$$

$$20 \text{ sols} = 1 \text{ franc.}$$

Rule.—Multiply 760 7 6 by 104, price of exchange, and divide the product by 20 sols.

760 7 6	20)	79079	(3953 95 result
104		190	
		107	
3040		79	
7600		19	
for 5 soldi.....	26	100	
for 2 ditto 6 den...	13		
		1900	
		100	
		0	
		79079	

See the proof of this operation, p. 77.

FRANCE ON PORTUGAL.

Reduce 135815 reis into francs and cents, at the exchange of 460 reis for 3 francs.

Equation. $135815 = x$
 $460 \text{ reis} = 3 \text{ francs.}$

Rule.—Multiply 135815 by 3 francs, and divide the product by 460 reis, price of exchange.

$$\begin{array}{r}
 135815 \\
 \times 3 \\
 \hline
 3944 \quad 460)407445(885 \text{ 75 result} \\
 2645 \\
 345 \\
 100 \\
 \hline
 34500 \\
 2300 \\
 0
 \end{array}$$

See the proof of this operation, page 91.

FRANCE ON SPAIN.

Reduce 187 pistoles 22 reals of plate into livres and sols tournois, at the exchange of 14 livres 8 sols tournois per pistole of exchange.

Equation. $187 \text{ 22} = x$
 $1 \text{ pistole} = 14 \text{ livres 8 sols.}$

Rule.—Multiply 187 22 by 14 8, price of exchange.

$$\begin{array}{r}
 187 \text{ 22} \\
 \times 14 \text{ 8} \\
 \hline
 748 \\
 187 \\
 \hline
 \text{for 4 sols} \dots\dots\dots 37 \text{ 8} \\
 \text{for 4 sols} \dots\dots\dots 37 \text{ 8} \\
 \text{for 16 reals} \dots\dots\dots 7 \text{ 4} \\
 \text{for 4 reals} \dots\dots\dots 1 \text{ 16} \\
 \text{for 2 reals} \dots\dots\dots 18 \\
 \hline
 2702 \text{ 14 result.}
 \end{array}$$

See the proof of this operation, page 103.

20 sols or 100 centimes = 1 franc.

FRANCE ON SPAIN.

Reduce 290 dollars 7 reals 17 maravedis of plate into livres, sols, and deniers tournois, at the exchange of 76 sols tournois per dollar of exchange.

Equation. $290\ 7\ 17 = x$

1 dollar = 76 sols
20 sols = 1 livre.

Rule.—Multiply 290 7 17 by 76, price of exchange, and divide the product by 20 sols.

$$\begin{array}{r}
 290\ 7\ 17 \\
 76 \\
 \hline
 1740 \\
 2030 \\
 \text{for 4 reals} \dots\dots\dots 38 \\
 \text{for 2 reals} \dots\dots\dots 19 \\
 \text{for 1 real} \dots\dots\dots 9\ 6 \\
 \text{for 17 maravedis} \dots\dots 4\ 9 \\
 \hline
 20)22111\ 3 \\
 \hline
 1105\ 11\ 3\ \text{result.}
 \end{array}$$

See the proof of this operation, page 104.

20 sols or 100 centimes = 1 franc.

FRANCFORT ON THE MAINE.

Monies of Exchange, and Regulations.

A rixdollar (*Thaler*) = $1\frac{1}{2}$ gulden = $22\frac{1}{2}$ batzen or 90 cruitzers.

A gulden = 15 batzen or 60 cruitzers.

A batzen = 4 cruitzers or 6 fenings.

2 rixdollars = 3 guldens.

2 ditto = 45 batzen.

Accounts are kept in rixdollars and cruitzers current, and in guldens and cruitzers current.

4 days of grace are allowed ; but bills at sight must be paid or protested when due.

Course of Exchange.

<i>Uncertain Prices.</i>		<i>Certain Prices.</i>
London	rec.....145½ batzen	for.....1 pound sterling.
Amsterdam.....	rec.....139 rixdollars	for.....100 rixdollars current.
Augsburg	rec.....99 guldens	for.....100 guldens current.
Bremen	giv.....106 rixdollars	for.....100 rixdollars.
France.....	rec.....77 rixdollars	for.....500 francs.
Hamburg	rec.....147 rixdollars	for.....100 rixdollars banco.
Vienna	rec.....77 guldens	for.....100 guldens.

FRANCFORT ON LONDON.

Reduce 548 pounds 17 shillings 6 pence sterling into rixdollars and cruitzers, at the exchange of 146 batzen per pound sterling.

Equation. $548\ 17\ 6 = x$
 $1\ \text{pound} = 146\ \text{batzen}$
 $45\ \text{batzen} = 2\ \text{rixdollars}.$

Rule.—Multiply 548 17 6 by 146, price of exchange, and by 2 rixdollars; divide the product by 45 batzen.

	548 17 6	45)	160271½	(3561 53 result.
146 × 2 =	292		252	
	1096		277	
	4932		71	
	1096		26	
for 10 shillings..	146		90	
for 5 ditto.....	73		2385	
for 2 do. 6 pence	36½		135	
			0	
	160271½			

To prove this operation, multiply 3561 53 by 45 batzen; and divide the product by 146, price of exchange, and by 2 rixdollars.

FRANCFORT ON FRANCE.

Reduce 6375 francs into rixdollars and cruitzers current, at the exchange of 76 rixdollars current for 300 francs.

Equation. $6375 = x$
 $300\ \text{francs} = 76\ \text{rixdollars}.$

Rule.—Multiply 6375 by 76, price of exchange, and divide the product by 300 francs.

6375
76
—
38250
44625
—

$300)484500(1615\ \text{result}.$

To prove this operation, multiply 1615 by 300 francs, and divide the product by 76, price of exchange.

FRANCFORT ON HAMBURG.

Reduce 3648 marcs 8 shillings lubs banco into rixdollars and cruitzers current, at the exchange of 146 rixdollars current for 100 rixdollars banco.

Equation.

$$\begin{array}{lcl} 3648 \text{ 8} & = & x \\ 3 \text{ marcs} & = & 1 \text{ rixdollar} \\ 100 \text{ rixdollars} & = & 146 \text{ rixdollars.} \end{array}$$

Rule.—Multiply 3648 8 by 146, price of exchange, and divide the product by 300, fixed number.

	3648 8	300)	532681(1775 54 result
	146		2326
	—		2268
	21888		— 1681
	14592		181
	3648		90
for 8 shillings	73		—
	—		16290
	532681		1290
			90

To prove this operation, multiply 1775 54 by 300, fixed number, and divide the product by 146, price of exchange.

GENEVA.

Monies of Exchange, and Regulations.

A crown current or patagon = 3 livres or 60 sols current.

A livre current = 20 sols or 240 deniers current.

A sol current = 12 deniers current.

Accounts are kept in livres, sols, and deniers current.

The value of usance for bills drawn from France, England, and Holland, is 30 days after date, and from Germany and Italy 15 days after sight.

There are 5 days of grace exclusive of Sundays.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	giv 49 pence sterling	for . . . 1 crown current.
Amsterdam	giv 89 grotes Flemish	for . . . 1 crown current.
Augsburg	giv 127 rixdollars current	for . . . 100 crowns current.
France	giv 166 francs	for . . . 100 livres current.
Genoa	rec 95 crowns current	for . . . 100 pezze fuori di banco.
Hamburg	rec 23 sols current	for . . . 1 marc lubs banco.
Leghorn	rec 104 crowns current	for . . . 100 pezze of 8 reals.
Milan	rec 98 crowns current	for . . . 640 lire current.
Spain	rec 44 sols current	for . . . 1 dollar of exchange.
Switzerland	rec 161 livres current	for . . . 100 florins.
Turin	giv 84 soldi	for . . . 1 crown current.

GENEVA ON LONDON.

Reduce 288 pounds 5 shillings 9 pence sterling into livres, sols, and deniers current, at the exchange of 48 pence sterling per crown current.

Equation.

$$\begin{aligned} 288 \text{ } 5 \text{ } 9 &= x \\ 1 \text{ pound} &= 240 \text{ pence} \\ 48 \text{ pence} &= 1 \text{ crown} \\ 1 \text{ crown} &= 3 \text{ livres.} \end{aligned}$$

Rule.—Multiply 288 5 9 by 720, fixed number, and divide the product by 48, price of exchange.

288 5 9	48)	207567	(4324 6 3 result
720		155	
—		116	
5760		207	
2016		15	
for 5 shillings..... 180		20	
for 9 pence..... 27		—	
—		300	
207567		12	
		12	
		—	
		144	
		0	

To prove this operation, multiply 4324 6 3 by 48, price of exchange, and divide the product by 720, fixed number.

GENEVA ON AMSTERDAM.

Reduce 356 florins 17 stivers 8 penings banco into livres, sols, and deniers current, at the exchange of 90 grotes Flemish banco per crown current.

Equation.

$$\begin{aligned} 356 \text{ } 17 \text{ } 8 &= x \\ 1 \text{ florin} &= 40 \text{ grotes} \\ 90 \text{ grotes} &= 1 \text{ crown} \\ 1 \text{ crown} &= 3 \text{ livres.} \end{aligned}$$

Rule.—Multiply 356 17 8 by 120, fixed number, and divide the product by 90, price of exchange.

356 17 8	90)	42825	(475 16 8 result.
120		682	
—		525	
7120		75	
356		20	
—		—	
for 10 stivers..... 60		1500	
for 5 ditto..... 30		600	
for 2 do. 8 penings.. 15		60	
—		12	
42825		720	
		0	

To prove this operation, multiply 475 16 8 by 90, price of exchange, and divide the product by 120, fixed number.

GENEVA ON FRANCE.

Reduce 605 francs 85 cents into livres, sols, and deniers current, at the exchange of 168 francs for 100 livres current.

Equation. $605\ 85 = x$

168 francs = 100 livres.

Rule.—Multiply 605 85 by 100 livres current, and divide the product by 168, price of exchange.

$$\begin{array}{r}
 605\ 85 \\
 100 \\
 \hline
 168)60585(360\ 12\ 6\ \text{result} \\
 1018 \\
 105 \\
 20 \\
 \hline
 2100 \\
 420 \\
 84 \\
 12 \\
 \hline
 168 \\
 84 \\
 \hline
 1008 \\
 0
 \end{array}$$

To prove this operation, multiply 360 12 6 by 168, price of exchange, and divide the product by 100 livres.

GENEVA ON HAMBURG.

Reduce 189 marcs 12 shillings 6 fenings lubs banco into livres, sols, and deniers current, at the exchange of 23 sols current per marc lubs banco.

Equation. $189\ 12\ 6 = x$

1 marc = 23 sols

20 sols = 1 livre.

Rule.—Multiply 189 12 6 by 23, price of exchange, and divide the product by 20 sols.

$$\begin{array}{r}
 189\ 12\ 6 \\
 23 \\
 \hline
 567 \\
 378 \\
 \hline
 \text{for 8 shillings} \quad - \quad - \quad - \quad - \quad 11\ 10 \\
 \text{for 4 ditto} \quad - \quad - \quad - \quad - \quad 5\ 15 \\
 \text{for 6 fenings} \quad - \quad - \quad - \quad - \quad 14\frac{1}{2} \\
 \hline
 20)4364\ 19\frac{1}{2} \\
 218\ 4\ 11\ \text{result.}
 \end{array}$$

To prove this operation, multiply 218 4 11 by 20 sols, and divide the product by 23, price of exchange.

GENOA.

Monies of Exchange, and Regulations.

A pezza fuori di banco, or out of bank, which is divided into 20 soldi, and a soldo into 12 denari, = 5 lire banco = $5\frac{1}{4}$ lire or 115 soldi fuori di banco.

A crown of exchange (*scudo di cambio*) = 4 lire banco = $4\frac{1}{2}$ lire or 92 soldi fuori di banco.

A gold crown (*scudo de oro*) is reckoned 10 lire 14 soldi or 214 soldi fuori di banco.

A lira banco and a lira fuori di banco are each divided into 20 soldi, and a soldo into 12 denari; but 100 lire banco = 115 lire fuori di banco.

A zecchino..... = $13\frac{1}{2}$ lire fuori di banco.
 4 pezze..... = 5 crowns of exchange.
 214 pezze..... = 115 gold crowns.
 107 lire fuori di banco..... = 10 gold crowns.
 107 crowns of exchange..... = 46 gold crowns.
 Accounts are kept in lire, soldi, and denari fuori di banco.

Value of usances for bills drawn from

London and Lisbon.....3 months after date.
 Amsterdam, Hamburg, and Spain.....2 months after date.
 Leghorn and Milan.....8 days after sight.

There are 30 days of grace, but bills are generally protested in the week after they are due.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

London.....	giv.....	46 pence sterling	for.....	1 pezza fuori di banco.
Amsterdam.....	giv.....	86 grotes Flemish	for.....	1 pezza fuori di banco.
Augsburg.....	rec.....	62 soldi fuori di banco	for.....	1 gulden current.
Constantinople.....	rec.....	52 soldi fuori di banco	for.....	1 piastre.
France.....	giv.....	98 sols in francs	for.....	1 pezza fuori di banco.
Hamburg.....	rec.....	46 soldi fuori di banco	for.....	1 mare lubs banco.
Leghorn.....	rec.....	127 soldi fuori di banco	for.....	1 pezza of 8 reals.
Lisbon.....	giv.....	750 reis	for.....	1 pezza fuori di banco.
Milan.....	giv.....	87 soldi current	for.....	1 crown of exchange.
Naples.....	rec.....	104 soldi fuori di banco	for.....	1 ducat di regno.
Rome.....	rec.....	132 soldi fuori di banco	for.....	1 crown current.
Sicily.....	giv.....	39 carlins	for.....	1 gold crown.
Smyrna.....	rec.....	32 soldi fuori di banco	for.....	1 piastre.
Spain.....	giv.....	680 maravedis	for.....	1 gold crown.
Venice.....	giv.....	38 soldi piccoli	for.....	1 lira fuori di banco.
Vienna.....	rec.....	45 soldi fuori di banco	for.....	1 gulden.

GENOA ON LONDON.

Reduce 239 pounds 11 shillings 3 pence sterling into lire, soldi, and denari fuori di banco, at the exchange of 45 pence sterling per pezza of 5 lire 15 soldi fuori di banco.

Equation.

$$239\ 11\ 3 = x$$

$$1\ \text{pound} = 240\ \text{pence}$$

$$45\ \text{pence} = 1\ \text{pezza}$$

$$1\ \text{pezza} = 5\ \text{lire}\ 15\ \text{soldi.}$$

Rule.—Reduce 239 11 3 into pence; divide the product by 45, price of exchange; and multiply the quotient by 5 lire 15 soldi.

239 11 3	45	57495	(1277 13 4	pezze
20		124		5 15
4791		349		
12		345	6385	
9585		30	638 10	for 10 soldi
4791		20	319 5	- 5 ditto
		600	2 17 6	- 10 ditto
		150	19 2	- 3 do. 4 den.
57495		15	7346 11 8	result,
		12		
		180		
		0		

See the proof of this operation, page 27.

GENOA ON AMSTERDAM.

Reduce 1215 florins 10 stivers banco into lire fuori di banco, at the exchange of 85 grotes Flemish banco per pezza of $5\frac{1}{2}$ lire fuori di banco.

Equation.

$$1215\ 10 = x$$

$$1\ \text{florin} = 40\ \text{grotes}$$

$$85\ \text{grotes} = 1\ \text{pezza}$$

$$1\ \text{pezza} = 5\frac{1}{2}\ \text{lire.}$$

Rule.—Multiply 1215 10 by 230, fixed number, and divide the product by 85, price of exchange.

1215 10	85	279565	(3289	result = 572	pezze.
230		245			
36450		756			
2430		765			
for 10 stivers.. 115		0			
		279565			

See the proof of this operation, page 34.

GENOA ON FRANCE.

Reduce 1153 francs 80 cents into lire, soldi, and denari fuori di banco, at the exchange of 96 sols in francs per pezza of $5\frac{3}{4}$ lire fuori di banco.

Equation.

$$1153 \cdot 80 = x$$

1 franc = 20 sols

96 sols = 1 pezza

1 pezza = $5\frac{3}{4}$ lire.

Rule.—Multiply 1153 80 by 115, fixed number, and divide the product by 96, price of exchange.

1153 80	96)132687(1382 3 1½	result=240 7 6 pezze.
115	366	
	788	
5765	207	
1153	15	
1153	20	
for 50 cents 57 10		
for 30 cents 34 10	300	
	12	
132687	12	
	144	
	48	

See the proof of this operation, page 56.

20 sols or 100 centimes = 1 franc.

GENOA ON HAMBURG.

Reduce 789 marcs 13 shillings 4 fenings lubs banco into lire, soldi, and denari fuori di banco, at the exchange of $46\frac{1}{2}$ soldi fuori di banco per marc lubs banco.

Equation.

$$789 \ 13 \ 4 = x$$

1 marc = 46½ soldi

20 soldi = 1 lira.

Rule.—Multiply 789 13 4 by $46\frac{1}{2}$, price of exchange, and divide the product by 20 soldi.

	789	13	4
	46 $\frac{1}{2}$		
	4734		
	3156		
for $\frac{1}{2}$	394	10	
for 8 shillings	23	5	
for 4 ditto	11	12	6
for 1 do. 4 fenings	3	17	6
	20)	36727	5
	1836	7	3

To prove this operation, multiply 1836 7 3 by 20, and divide the product by $46\frac{1}{2}$, price of exchange.

GENOA ON LEGHORN.

Reduce 210 pezze 16 soldi 8 denari of 8 reals into lire, soldi, and denari fuori di banco, at the exchange of 124 soldi fuori di banco per pezza of 8 reals.

Equation. $210\ 16\ 8 = x$

1 pezza = 124 soldi

20 soldi = 1 lira.

Rule.—Multiply 210 16 8 by 124, price of exchange, and divide the product by 20 soldi.

	210	16	8
	124		
	840		
	420		
	210		
for 10 soldi....	62		
for 5 ditto	31		
for 1 do. 8 den.	10	6	8
	20	26143	6 8

1307 3 4 result.

See the proof of this operation, page 78.

GENOA ON NAPLES.

Reduce 257 ducats 50 grains di regno into lire, soldi, and denari fuori di banco, at the exchange of $104\frac{1}{2}$ soldi fuori di banco per ducat di regno.

Equation. $257\ 50 = x$

1 ducat = $104\frac{1}{2}$ soldi

20 soldi = 1 lira.

Rule.—Multiply 257 50 by $104\frac{1}{2}$, price of exchange, and divide the product by 20 soldi.

	257	50
	$104\frac{1}{2}$	
	1028	
	2570	
for $\frac{1}{2}$	128	10
for 50 grains	52	5
	20	26908 15

1345 8 9 result.

See the proof of this operation, page 86.

F 2

GENOA ON PORTUGAL.

Reduce 228834 reis into lire, soldi, and denari fuori di banco, at the exchange of 720 reis per pezza of $5\frac{3}{4}$ lire fuori di banco.

Equation.

$$228834 = x$$

$$720 \text{ reis} = 1 \text{ pezza}$$

$$1 \text{ pezza} = 5\frac{3}{4} \text{ lire.}$$

Rule.—Multiply 228834 by $5\frac{3}{4}$ lire, and divide the product by 720, price of exchange.

228834	720)	1315795 $\frac{1}{2}$	(1827 9 10 $\frac{1}{2}$ result = 317 16 6 pezze
$5\frac{3}{4}$		5957	
		1979	
1144170		5395	
for $\frac{1}{2}$ 114417		855	
for $\frac{1}{4}$ 57208 $\frac{1}{2}$		20	
1315795 $\frac{1}{2}$		7110	
		630	
		12	
		1260	
		630	
		7560	
		360	

See the proof of this operation, page 92.

GENOA ON SICILY.

Reduce 75 ounces 22 tarins 10 grains into lire, soldi, and denari fuori di banco, at the exchange of 39 carlins per gold crown of 10 lire 14 soldi fuori di banco.

Equation.

$$75 \ 22 \ 10 = x$$

$$1 \text{ ounce} = 60 \text{ carlins}$$

$$39 \text{ carlins} = 10 \text{ lire } 14 \text{ soldi.}$$

Rule.—Multiply 75 22 10 by 642, fixed number, and divide the product by 39, price of exchange.

75 22 10	39)	48631 10	(1246 19 2 result
642		96	
		183	
150		271	
300		37	
450		20	
for 15 tarins..... 321			
for 7 do. 10 grains . 160 10		750	
		360	
48631 10		9	
		12	
		108	
		30	

To prove this operation, multiply 1246 19 2 by 39, price of exchange, and divide the product by 642, fixed number.

GENOA ON SPAIN.

Reduce 485 dollars 7 reals 7 maravedis of plate into lire, soldi, and denari fuori di banco, at the exchange of 660 maravedis of plate per gold crown of 10 lire 14 soldi fuori di banco.

Equation.

$$485 \ 7 \ 7 = x$$

$$1 \text{ dollar} = 272 \text{ maravedis}$$

$$660 \text{ maravedis} = 10 \text{ lire } 14 \text{ soldi.}$$

Rule.—Reduce 485 7 7 into maravedis; multiply by 10 lire 14 soldi; and divide the product by 660, price of exchange.

485 7 7	660	1414165½	(2142 13 6 result.
8		941	
3887		2816	
34		1765	
15555		445	
11661		20	
132165		8910	
10 14		2310	
1321650		330	
for 10 soldi.....	66082½	12	
for 4 ditto.....	26433	3960	
		0	
		1414165½	

To prove this operation, multiply 2142 13 6 by 660, price of exchange; divide the product by 10 lire 14 soldi, and reduce the quotient into dollars.

GENOA ON VENICE.

Reduce 1820 lire 16 soldi 8 denari piccoli into lire, soldi, and denari fuori di banco, at the exchange of 38 soldi piccoli per lira fuori di banco.

Equation.

$$1820 \ 16 \ 8 = x$$

$$1 \text{ lira} = 20 \text{ soldi}$$

$$38 \text{ soldi} = 1 \text{ lira.}$$

Rule.—Multiply 1820 16 8 by 20 soldi, and divide the product by 38, price of exchange.

1820 16 8	
20	
38)36416 13 4	(958 6 8 result.
221	
316	
12	
20	
253	
25	
12	
54	
25	
304	
0	

See the proof of this operation, page 120.

HAMBURG AND ALTONA.

Monies of Exchange, and Regulations.

A rixdollar = 3 marcs lubs = 48 shillings lubs = 8 shillings Flemish or 96 grotes Flemish.

A marc lubs = 16 shillings lubs = 192 fenings lubs = $2\frac{2}{3}$ shillings Flemish or 32 grotes Flemish.

A shilling lubs = 12 fenings lubs or 2 grotes Flemish.

A pound Flemish = 20 shillings Flemish = 240 grotes Flemish or $7\frac{1}{2}$ marcs lubs.

A shilling Flemish = 12 grotes Flemish or 6 shillings lubs.

A grote Flemish = $\frac{1}{2}$ shilling lubs or 6 fenings lubs.

3 marcs lubs = 8 shillings Flemish.

Accounts are kept in marcs, shillings, and fenings lubs.

Value of usances for bills drawn from
England and France.....1 month after date.

Italy, Portugal, and Spain..2 months after date.

There are 12 days of grace, Sundays and holidays included ; but bills due on Sunday or on a holiday must be paid or protested the day before.

The difference between bank money and current money is from 18 to 26 per cent, that is to say,

100 marcs banco = from 118 to 126 marcs current.

HAMBURG AND ALTONA.

Course of Exchange.

<i>Uncertain Prices.</i>		<i>Certain Prices.</i>	
London.....	rec.....35 shillings Flemish.....	for.....	1 pound sterling.
Augsburg.....	giv.....149 rixdollars current.....	for.....	100 rixdollars banco.
Breslaw.....	rec.....42 shillings lubs banco.....	for.....	1 pound banco.
Copenhagen.....	giv.....148 rixdollars.....	for.....	100 rixdollars banco.
France.....	rec.....25 shillings lubs banco.....	for.....	3 francs.
Genoa.....	rec.....78 grotes Flemish.....	for.....	1 pezza fuori di banco.
Holland.....	giv.....54 stivers banco.....	for.....	2 marcs lubs banco.
Idem.....	giv.....108 florins current.....	for.....	120 marcs lubs banco.
Leghorn.....	rec.....84 grotes Flemish.....	for.....	1 pezza of 8 reals.
Milan.....	rec.....145 soldi current.....	for.....	1 rixdollar banco.
Portugal.....	rec.....43 grotes Flemish.....	for.....	1 crusade of 400 reis.
Prague.....	giv.....204 guldens current.....	for.....	200 marcs lubs banco.
Spain.....	rec.....84 grotes Flemish.....	for.....	1 ducat of exchange.
Switzerland.....	rec.....24 shillings lubs banco.....	for.....	3 livres.
Idem.....	giv.....25 sols.....	for.....	1 marc lubs banco.
Venice.....	giv.....4 lire 8 soldi piccoli.....	for.....	1 marc lubs banco.
Vienna.....	giv.....203 guldens current.....	for.....	200 marcs lubs banco.

HAMBURG ON LONDON.

Reduce 106 pounds 17 shillings 6 pence sterling into marcs, shillings, and fenings lubs banco, at the exchange of 35 shillings 4 grotes Flemish banco per pound sterling.

Equation.

$$\begin{aligned} 106 \ 17 \ 6 &= x \\ 1 \text{ pound} &= 35 \text{ shillings } 4 \text{ grotes} \\ 1 \text{ shilling} &= 12 \text{ grotes} \\ 32 \text{ grotes} &= 1 \text{ marc.} \end{aligned}$$

Rule.—Multiply 106 17 6 by 35 4, price of exchange, and by 12 grotes; divide the product by 32 grotes.

$35 \ 4 \times 12 = 424$ 424 212 424 for 10 shillings... 212 for 5 ditto..... 106 for 2 do. 6 pence.. 53 45315	106 17 6 32)45315(1416 1 6 result. 183 51 195 3 16 48 16 12 192 0
---	---

See the proof of this operation, p. 28.

N. B. When the price of exchange consists of shillings Flemish only, multiply the price of exchange by 3 instead of 12, and divide the product by 8 instead of 32.

HAMBURG ON AMSTERDAM.

Reduce 3231 florins 4 stivers 4 penings banco into marcs, shillings, and fenings lubs banco, at the exchange of 34½ stivers banco for 2 marcs lubs banco.

Equation.

$$\begin{aligned} 3231 \ 4 \ 4 &= x \\ 1 \text{ florin} &= 20 \text{ stivers} \\ 34\frac{1}{2} \text{ stivers} &= 2 \text{ marcs.} \end{aligned}$$

Rule.—Multiply 3231 4 4 by 40, fixed number, and divide the product by 34½, price of exchange.

34½ 2 fraction 69 for 4 stivers..... 8 for 4 penings..... ½ 129248½ 2 fraction 258497	3231 4 4 69)258497(3746 5 4 result. 514 319 487 23 16 138 23 368 23 12 276 0
--	--

See the proof of this operation, page 34.

HAMBURG ON AMSTERDAM.

Reduce 2521 florins 9 stivers 8 penings current into marcs and shillings lubs banco, at the exchange of 106 florins current for 120 marcs lubs banco.

Equation. $2521\ 9\ 8 = x$

$106\ \text{florins} = 120\ \text{marcs.}$

Rule.—Multiply 2521 9 8 by 120 marcs, and divide the product by 106, price of exchange.

2521 9 8	106	302577	(2854 8 result
120		905	
		577	
		477	
		53	
		16	
50420			
2521			
for 5 stivers.....	30		
for 4 ditto.....	24		
for 8 penings.....	3		
		848	
		0	
		302577	

See the proof of this operation, page 35.

HAMBURG ON FRANCE.

Reduce 2760 francs 25 cents into marcs, shillings, and fenings lubs banco, at the exchange of $25\frac{1}{2}$ shillings lubs banco for 3 francs.

Equation. $2760\ 25 = x$

$3\ \text{francs} = 25\frac{1}{2}\ \text{shillings}$
 $16\ \text{shillings} = 1\ \text{marc.}$

Rule.—Multiply 2760 25 by $25\frac{1}{2}$, price of exchange, and divide the product by 48, fixed number.

2760 25	48	70386 6	(1466 6 1 result
$25\frac{1}{2}$		223	
		318	
		306	
		18	
		16	
13800			
5520			
for $\frac{1}{2}$	1380		
for 25 cents.....	$6\frac{6}{16}$		
		114	
		18	
		294	
		6	
		12	
		72	
		24	
		70386 6	

See the proof of this operation, page 57.

HAMBURG ON GENOA.

Reduce 424 pezze 18 soldi 4 denari fuori di banco into marcs, shillings, and fenings lubs banco, at the exchange of 78 grotes Flemish banco per pezza of 115 soldi fuori di banco.

Equation.

$$424 \ 18 \ 4 = x$$

$$1 \text{ pezza} = 78 \text{ grotes}$$

$$32 \text{ grotes} = 1 \text{ marc.}$$

Rule.—Multiply 424 18 4 by 78, price of exchange, and divide the product by 32 grotes.

424 18 4	32)	33143½	(1035 11 9 result
78		114	
		183	
		23	
		16	
3392			
2968			
for 10 soldi.....	39	146	
for 5 ditto.....	19½	23	
for 2 do. 6 den....	9¾	376	
for 10 den.....	3¼	56	
		24	
		12	
33143½		288	
		0	

To prove this operation, multiply 1035 11 9 by 32 grotes, and divide the product by 78, price of exchange.

HAMBURG ON LEGHORN.

Reduce 354 pezze 17 soldi 6 denari of 8 reals into marcs, shillings, and fenings lubs banco, at the exchange of 84 grotes Flemish banco per pezza of 8 reals.

Equation.

$$354 \ 17 \ 6 = x$$

$$1 \text{ pezza} = 84 \text{ grotes}$$

$$32 \text{ grotes} = 1 \text{ marc.}$$

Rule.—Multiply 354 17 6 by 84, price of exchange, and divide the product by 32 grotes.

354 17 6	32)	29809½	(931 8 9 result
84		100	
		49	
		17	
		16	
1416			
2832			
for 10 soldi.....	42	110	
for 5 ditto.....	21	17	
for 2 do. 6 den....	10½	280	
		24	
29809½		12	
		48	
		24	
		288	
		0	

See the proof of this operation, page 78.

HAMBURG ON PORTUGAL.

Reduce 534 crusades 160 reis into marcs and shillings lubs banco, at the exchange of $42\frac{1}{2}$ grotes Flemish banco per crusade of 400 reis.

Equation.

$$\begin{aligned} 534 \ 160 &= x \\ 1 \text{ crusade} &= 42\frac{1}{2} \text{ grotes} \\ 32 \text{ grotes} &= 1 \text{ marc.} \end{aligned}$$

Rule.—Multiply 534 160 by $42\frac{1}{2}$, price of exchange, and divide the product by 32 grotes.

534 160		32)22712(709 12 result
42 $\frac{1}{2}$		312
—		24
1068		16
2136		—
for $\frac{1}{2}$ 267		144
for 100 reis 10 $\frac{5}{8}$		24
for 60 reis 6 $\frac{3}{8}$		—
—		384
22712		64
		0

See the proof of this operation, page 92.

HAMBURG ON SPAIN.

Reduce 452 ducats 17 sueldos 6 dineros of exchange into marcs, shillings, and fenings lubs banco, at the exchange of 84 grotes Flemish banco per ducat of exchange.

Equation.

$$\begin{aligned} 452 \ 17 \ 6 &= x \\ 1 \text{ ducat} &= 84 \text{ grotes} \\ 32 \text{ grotes} &= 1 \text{ marc.} \end{aligned}$$

Rule.—Multiply 452 17 6 by 84, price of exchange, and divide the product by 32 grotes.

452 17 6		32)38041 $\frac{1}{2}$ (1188 12 9 result
84		60
—		284
1808		281
3616		25
		16
for 10 sueldos.... 42		—
for 5 ditto..... 21		158
for 2 ditto. 6 din. 10 $\frac{1}{2}$		25
—		—
38041 $\frac{1}{2}$		408
		88
		24
		12
		—
		288
		0

To prove this operation, multiply 1188 12 9 by 32 grotes, and divide the product by 84, price of exchange.

HAMBURG ON VIENNA.

Reduce 888 guldens 15 cruitzers into marcs, shillings, and fenings lubs banco, at the exchange of 204 guldens for 200 marcs lubs banco.

Equation.

$$888\ 15 = x$$

$$204\ \text{guldens} = 200\ \text{marcs.}$$

Rule.—Multiply 888 15 by 200 marcs, and divide by 204, price of exchange.

888 15	204	177650	(870 13 4 result
200		1445	
		170	
177600		16	
for 15 cruitzers.. 50			
		1020	
177650		170	
		2720	
		680	
		68	
		12	
		136	
		68	
		816	
		0	

See the proof of this operation, page 124.

LEGHORN.

Monies of Exchange, and Regulations.

A pezza of 8 reals (*da otto reali*) = $5\frac{3}{4}$ lire moneta buona = 6 lire moneta lunga = 20 soldi or 240 denari of 8 reals.

A soldo of 8 reals = 12 denari of 8 reals.

A lira moneta buona and a lira moneta lunga are each divided into 20 soldi, and a soldo into 12 denari.

23 lire moneta buona = 24 lire moneta lunga.

Accounts are kept in pezze, soldi, and denari of 8 reals.

Value of usances for bills drawn from

England and Portugal	3 months after date.
Hamburg, Holland, and Spain	2 months after date.
France	30 days after date.
Genoa, Milan, and Switzerland.....	8 days after sight.

There are no days of grace ; but bills of exchange are paid only on Mondays, Wednesdays, and Fridays.

LEGHORN.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

London.....	<i>giv</i>	49 pence sterling	.....	<i>for</i>	1 pezza of 8 reals.
Augsburg.....	<i>giv</i>	198 guldens current	.....	<i>for</i>	100 pezze ditto.
Constantinople.....	<i>giv</i>	158 paras	.....	<i>for</i>	1 pezza ditto.
France.....	<i>giv</i>	104 sols in francs	.....	<i>for</i>	1 pezza ditto.
Geneva.....	<i>giv</i>	105 crowns current	.....	<i>for</i>	100 pezze ditto.
Genoa.....	<i>giv</i>	124 soldi fuori di banco	.....	<i>for</i>	1 pezza ditto.
Hamburg.....	<i>giv</i>	86 grotes Flemish	.....	<i>for</i>	1 pezza ditto.
Holland.....	<i>giv</i>	92 grotes Flemish	.....	<i>for</i>	1 pezza ditto.
Milan.....	<i>giv</i>	125 soldi current	.....	<i>for</i>	1 pezza ditto.
Naples.....	<i>giv</i>	119 ducats di regno	.....	<i>for</i>	100 pezze ditto.
Portugal.....	<i>giv</i>	840 reis	.....	<i>for</i>	1 pezza ditto.
Rome.....	<i>giv</i>	117 bajocchi	.....	<i>for</i>	1½ pezza ditto.
Sicily.....	<i>giv</i>	12 tarins	.....	<i>for</i>	1 pezza ditto.
Spain.....	<i>giv</i>	140 dollars of exchange	.....	<i>for</i>	100 pezze ditto.
Venice.....	<i>giv</i>	12 lire piccole	.....	<i>for</i>	1 pezza ditto.
Vienna.....	<i>rec</i>	42 soldi moneta buona	.....	<i>for</i>	1 gulden.

LEGHORN ON LONDON.

Reduce 132 pounds 17 shillings 6 pence sterling into pezze, soldi, and denari of 8 reals, at the exchange of 48 pence sterling per pezza of 8 reals.

Equation.

$$132\ 17\ 6 = x$$

$$1\ \text{pound} = 240\ \text{pence}$$

$$48\ \text{pence} = 1\ \text{pezza}.$$

Rule.—Reduce 132 17 6 into pence, and divide the product by 48, price of exchange.

132 17 6	48)31890(664 7 6 result
20	309
—	210
2657	18
12	20
—	—
5320	360
2657	24
—	12
31890	—
	48
	24
	—
	288
	0

See the proof of this operation, page 28.

LEGHORN ON AMSTERDAM.

Reduce 1486 florins 18 stivers 8 penings banco into pezze, soldi, and denari of 8 reals, at the exchange of 88 grotes Flemish banco per pezza of 8 reals.

Equation. $1486\ 18\ 8 = x$

1 florin = 40 grotes

88 grotes = 1 pezza.

Rule.—Multiply 1486 18 8 by 40 grotes, and divide by 88, price of exchange.

	1486 18 8	88)59477(675 17 6 result
	40	667
	59440	517
		77
		20
for 10 stivers....	20	1540
for 8 ditto	16	660
for 8 penings ..	1	44
	59177	12
		88
		44
		528
		0

See the proof of this operation, page 35.

LEGHORN ON FRANCE.

Reduce 3953 francs 95 cents into pezze, soldi, and denari of 8 reals, at the exchange of 104 sols in francs per pezza of 8 reals.

Equation. $3953\ 95 = x$

1 franc = 20 sols

104 sols = 1 pezza.

Rule.—Multiply 3953 95 by 20 sols, and divide the product by 104, price of exchange.

	3953 95	104)79079(760 7 6 result
	20	627
	79060	89
		20
for 95 cents.....	19	780
	79079	52
		12
		104
		52
		624
		0

See the proof of this operation, page 57.

20 sols or 100 centimes = 1 franc.

LEGHORN ON GENOA.

Reduce 227 pezze 6 soldi 8 denari fuori di banco into pezze, soldi, and denari of 8 reals, at the exchange of 124 soldi fuori di banco per pezza of 8 reals.

Equation.

$$227 \ 6 \ 8 = x$$

$$1 \text{ pezza} = 115 \text{ soldi}$$

$$124 \text{ soldi} = 1 \text{ pezza.}$$

Rule.—Multiply 227 6 8 by 115 soldi, and divide the product by 124, price of exchange.

	227 6 8	124)26143 6 8(210 16 8 result
	115	134
		103
		20
	1135	
	227	2066
	227	826
for 4 soldi....	23	82
for 2 ditto....	11 10	13
for 8 denari ..	3 16 8	172
		82
	26143 6 8	992
		0

See the proof of this operation, page 67.

LEGHORN ON HAMBURG.

Reduce 931 marcs 8 shillings 9 fenings lubs banco into pezze, soldi, and denari of 8 reals, at the exchange of 84 grotes Flemish banco per pezza of 8 reals.

Equation.

$$931 \ 8 \ 9 = x$$

$$1 \text{ marc} = 32 \text{ grotes}$$

$$84 \text{ grotes} = 1 \text{ pezza.}$$

Rule.—Multiply 931 8 9 by 32 grotes, and divide the product by 84, price of exchange.

	931 8 9	84)29809½(354 17 6 result
	32	460
		409
		73
		20
	1862	
	2793	1470
for 8 shillings..	16	630
for 9 fenings ..	1½	42
		12
	29809½	84
		42
		504
		0

See the proof of this operation, page 73.

LEGHORN ON NAPLES.

Reduce 215 ducats 35 grains di regno into pezze and soldi of 8 reals, at the exchange of 118 ducats di regno for 100 pezze of 8 reals.

Equation.

$$215\ 35 = x$$

$$118\text{ ducats} = 100\text{ pezze.}$$

Rule.—Multiply 215 35 by 100 pezze, and divide the product by 118, price of exchange.

$$\begin{array}{r} 215\ 35 \\ 100 \\ \hline 118)21535(182\ 10\text{ result} \\ 973 \\ 295 \\ 59 \\ 20 \\ \hline 1180 \\ 0 \end{array}$$

See the proof of this operation, page 87.

LEGHORN ON PORTUGAL.

Reduce 635775 reis into pezze, soldi, and denari of 8 reals, at the exchange of 840 reis per pezza of 8 reals.

Equation.

$$635775 = x$$

$$840\text{ reis} = 1\text{ pezza.}$$

Rule.—Divide 635775 by 840, price of exchange.

$$840)635775(756\ 17\ 6\text{ result}$$

$$4777$$

$$5775$$

$$735$$

$$20$$

$$\hline 14700$$

$$6300$$

$$420$$

$$\hline 12$$

$$840$$

$$420$$

$$\hline 5040$$

$$0$$

See the proof of this operation, page 93.

LEGHORN ON SICILY.

Reduce 1576 ounces 20 tarins into pezze, soldi, and denari of 8 reals, at the exchange of 12 tarins per pezza of 8 reals.

Equation.

$$1576\ 20 = x$$

$$1\ \text{ounce} = 30\ \text{tarins}$$

$$12\ \text{tarins} = 1\ \text{pezza}.$$

Rule.—Multiply 1576 20 by 30 tarins, and divide the product by 12, price of exchange.

1576 20	12)47300(3941 13 4 result
30	113
47300	50
	20
	8
	20
	160
	40
	4
	12
	48
	0

See the proof of this operation, page 99.

LEGHORN ON SPAIN.

Reduce 327 dollars 2 reals of plate into pezze, soldi, and denari of 8 reals, at the exchange of 136 dollars of exchange for 100 pezze of 8 reals.

Equation.

$$327\ 2 = x$$

$$136\ \text{dollars} = 100\ \text{pezze}.$$

Rule.—Multiply 327 2 by 100 pezze, and divide the product by 136, price of exchange.

327 2	136)32725(240 12 6 result
100	552
32700	85
for 2 reals..... 25	20
32725	1700
	340
	68
	12
	136
	68
	816
	0

See the proof of this operation, page 105.

LEGHORN ON VENICE.

Reduce 2342 lire 16 soldi 3 denari piccoli into pezze, soldi, and denari of 8 reals, at the exchange of 11 lire 18 soldi piccoli per pezza of 8 reals.

Equation. $2342\ 16\ 3 = x$

$11\ \text{lire}\ 18\ \text{soldi} = 1\ \text{pezza}.$

Rule.—Divide 2342 16 3 by 11 18, price of exchange.

11 18	2342 16 3
20 fraction	20 fraction
238 div.	238)46856 5(196 17 6 result
	2305
	1636
	208
	20
	—
	4165
	1785
	119
	12
	—
	238
	119
	—
	1428
	0

See the proof of this operation, page 121.

LEIPSIC AND DRESDEN.

Monies of Exchange, and Regulations.

A rixdollar = $1\frac{1}{2}$ gulden or 24 good groshen.

A gulden = 16 good groshen.

A grosh = 12 fenings.

2 rixdollars = 3 florins.

Accounts are kept in rixdollars, groshen, and fenings.

The value of usance is generally 14 days after acceptance, and there are no days of grace.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	rec..... $6\frac{1}{2}$ rixdollars	for.....1 pound sterling.
Amsterdam	rec.....144 rixdollars	for.....100 rixdollars banco.
Dantzic	rec.....98 rixdollars	for.....100 rixdollars.
France	rec.....79 rixdollars	for.....300 francs.
Hamburg	rec.....149 rixdollars	for.....100 rixdollars banco.
Vienna	rec.....77 rixdollars	for.....100 rixdollars.

LEIPSIC ON LONDON.

Reduce 230 pounds 15 shillings 6 pence sterling into rixdollars, groshen, and fenings current, at the exchange of $6\frac{1}{2}$ rixdollars current per pound sterling.

Equation.

$$\begin{aligned} 230 \text{ } 15 \text{ } 6 &= x \\ 1 \text{ pound} &= 6\frac{1}{2} \text{ rixdollars.} \end{aligned}$$

Rule.—Multiply 230 15 6 by $6\frac{1}{2}$, price of exchange.

$$\begin{array}{r} 230 \text{ } 15 \text{ } 6 \\ 6\frac{1}{2} \\ \hline 1380 \text{ } 02 \\ \text{for } \frac{1}{2} \dots\dots\dots 115 \\ \text{for } 10 \text{ shillings } \dots\dots 3 \text{ } 6 \\ \text{for } 5 \text{ ditto } \dots\dots 1 \text{ } 15 \\ \text{for } 6 \text{ pence } \dots\dots 3 \text{ } 10\frac{8}{10} \\ \hline 1500 \text{ } 0 \text{ } 10\frac{8}{10} \text{ result.} \end{array}$$

To prove this operation, divide $1500 \text{ } 0 \text{ } 10\frac{8}{10}$ by $6\frac{1}{2}$, price of exchange.

LEIPSIC ON FRANCE.

Reduce 2437 francs into rixdollars, groshen, and fenings current, at the exchange of 78 rixdollars current for 300 francs.

Equation.

$$\begin{aligned} 2437 &= x \\ 300 \text{ francs} &= 78 \text{ rixdollars.} \end{aligned}$$

Rule.—Multiply 2437 by 78, price of exchange, and divide the product by 300 francs.

$$\begin{array}{r} 2437 \\ 78 \\ \hline 19496 \\ 17059 \\ \hline \end{array}$$

300)190086(630 36 result.

To prove this operation, multiply 630 36 by 300 francs, and divide the product by 78, price of exchange.

LEIPSIC ON HAMBURG.

Reduce 3768 marcs lubs banco into rixdollars, groshen, and fenings current, at the exchange of 148 rixdollars current for 100 rixdollars banco.

Equation.

$$3768 = x$$

$$3 \text{ marcs} = 1 \text{ rixdollar}$$

$$100 \text{ rixdollars} = 148 \text{ rixdollars.}$$

Rule.—Multiply 3768 by 148, price of exchange, and divide the product by 300, fixed number.

3768	300)557664(1858 21 1 result
148	2576
	1766
30144	2664
15072	264
3768	24
557664	1056
	528
	6836
	336
	36
	12
	432
	132

To prove this operation, multiply 1858 21.1 by 300, fixed number, and divide the product by 148, price of exchange.

MALTA.

Monies of Exchange, and Regulations.

A crown (*Scudo*) = 12 tarins or 240 grains.

A tarin = 20 grains.

Accounts are kept in crowns, tarins, and grains.

Malta exchanges with London by crowns, and gives 1 crown for 50 pence sterling, more or less.

Reduce 120 pounds sterling into crowns, at the exchange of 50 pence sterling per crown.

Equation.

$$120 \text{ pounds} = x$$

$$1 \text{ pound} = 240 \text{ pence}$$

$$50 \text{ pence} = 1 \text{ crown.}$$

Rule.—Multiply 120 by 240 pence, and divide the product by 50, price of exchange.

120	50)28800(576 result
240	380
	300
4800	0
240	
28800	

To prove this operation, multiply 576 by 50, price of exchange, and divide the product by 240 pence.

MILAN.

Monies of Exchange, and Regulations.

A lira current = 20 soldi current.

A soldo current = 12 denari current.

A lira imperiale = 20 soldi or 240 denari.

A Philip = 106 soldi imperiali or 7½ lire current.

A crown = 117 soldi imperiali.

15 lire current = 212 soldi ditto.

150 soldi current = 106 soldi ditto.

Accounts are kept in lire, soldi, and denari current.

No days of grace are allowed.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

Londonrec.....31 lire currentfor.....1 pound sterling.

Amsterdamrec.....57 soldi dittofor.....1 florin banco.

Augsburgrec.....66 soldi dittofor.....1 gulden current.

Francerec.....55 soldi imperialifor.....3 francs.

Genoarec.....86 soldi currentfor.....1 lire fuori di banco.

Hamburgrec.....49 soldi dittofor.....1 marc lubs banco.

Leghornrec.....135 soldi dittofor.....1 pezza of 8 reals.

Naplesrec.....104 soldi dittofor.....1 ducat di regno.

Romerec.....138 soldi dittofor.....1 crown current.

Idemgiv.....78 gold crownsfor.....100 crowns.

MILAN ON LONDON.

Reduce 150 pounds 10 shillings 6 pence sterling into lire, soldi, and denari current, at the exchange of 31 lire 15 soldi current per pound sterling.

Equation.

$$150 \ 10 \ 6 = x$$

$$1 \text{ pound} = 31 \text{ lire } 15 \text{ soldi.}$$

Rule.—Multiply 150 10 6 by 31 15, price of exchange.

$$\begin{array}{r} 150 \ 10 \ 6 \\ \times 31 \ 15 \\ \hline \end{array}$$

$$31 \ 15$$

$$\begin{array}{r} 150 \\ 450 \end{array}$$

$$\begin{array}{r} \text{for 10 soldi} \dots\dots\dots 75 \\ \text{for 5 ditto} \dots\dots\dots 37 \ 10 \\ \text{for 10 shillings} \dots\dots\dots 15 \ 17 \ 6 \\ \text{for 6 pence} \dots\dots\dots 15 \ 10 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 75 \\ 37 \ 10 \\ 15 \ 17 \ 6 \\ 15 \ 10 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 15 \ 17 \ 6 \\ 15 \ 10 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 15 \ 10 \frac{1}{2} \\ 4779 \ 3 \ 4 \frac{1}{2} \end{array}$$

$$4779 \ 3 \ 4 \frac{1}{2} \text{ result.}$$

To prove this operation, divide 4779 3 4½ by 31 15, price of exchange.

MILAN ON FRANCE.

Reduce 4675 francs 75 cents into lire, soldi, and denari current, at the exchange of 56 soldi imperiali for 3 francs.

Equation.

$$\begin{aligned} 4675 \text{ 75} &= x \\ 3 \text{ francs} &= 56 \text{ soldi imperiali} \\ 212 \text{ soldi imperiali} &= 15 \text{ lire current.} \end{aligned}$$

Rule.—Multiply 4675 75 by 56, price of exchange, and by 5, fixed number; divide the product by 212, fixed number.

4675 75	212	1309210	(6175 10 4 result)
56		372	
28050		1601	
23375		1170	
		110	
		20	
for 75 cents..... 42		2200	
		80	
		12	
		960	
		112	
5			
1309210			

To prove this operation, multiply 6175 10 4 by 212, fixed number; divide the product by 5, fixed number, and by 56, price of exchange.

NAPLES.

Monies of Exchange, and Regulations.

A ducat di regno = 10 carlins or 100 grains.

A carlin..... = 10 grains

Accounts are kept in ducats and grains di regno.

The value of usance for bills drawn from London is three months after date.

There are three days of grace.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

London	giv.....42	pence sterling.....	for.....1	ducat di regno.
Amsterdam	rec.....51	grains	for.....1	florin banco.
France	giv.....87	sols tournois in francs....	for.....1	ducat ditto.
Genoa	giv.....107	soldi fuori di banco ...	for.....1	ducat ditto.
Hamburg	rec.....45	grains.....	for.....1	marc lubs banco.
Leghorn	rec.....118	ducats di regno.....	for.....100	pezze of 8 reals.
Portugal.....	giv.....650	reis.....	for.....1	ducat di regno.
Rome.....	rec.....124	ducats di regno.....	for.....100	crowns.
Sicily	rec.....120	ducats ditto	for.....100	crowns of 12 tarins.
Spain	rec.....88	grains	for.....1	dollar of exchange.
Venice	giv.....200	soldi piccoli	for.....1	ducat di regno.
Vienna	rec.....43	grains.....	for.....1	gulden.

NAPLES ON LONDON.

Reduce 158 pounds 9 shillings 3 pence sterling into ducats and grains, at the exchange of $37\frac{1}{2}$ pence per ducat di regno.

Equation. $158\ 9\ 3 = x$

1 pound = 240 pence

$37\frac{1}{2}$ pence = 1 ducat.

Rule.—Reduce 158 9 3 into pence, and divide the product by $37\frac{1}{2}$, price of exchange.

$37\frac{1}{2}$	158 9 3	75)76062(1014 16 result
2 fraction	20	106
		312
75 div.	3169	12
	12	100
	6341	1200
	3169	450
		0
	38031	
	2 fraction	
	76062	

See the proof of this operation, page 29.

NAPLES ON GENOA.

Reduce 1345 lire 8 soldi 9 denari fuori di banco into ducats and grains, at the exchange of $104\frac{1}{2}$ soldi fuori di banco per ducat di regno.

Equation. $1345\ 8\ 9 = x$

1 lira = 20 soldi

$104\frac{1}{2}$ soldi = 1 ducat.

Rule.—Multiply 1345 8 9 by 20 soldi, and divide the product by $104\frac{1}{2}$, price of exchange.

$104\frac{1}{2}$	1345 8 9	
2 fraction	20	
209 div.	26908 15	
	2 fraction	
	209)538171(257 50 result	
	1201	
	1567	
	104	
	100	
	10450	
	0	

See the proof of this operation, page 67.

NAPLES ON LEGHORN.

Reduce 182 pezze 10 soldi of 8 reals into ducats and grains, at the exchange of 118 ducats di regno for 100 pezze of 8 reals.

Equation.

$$182 \text{ } 10 = x$$

$$100 \text{ pezze} = 118 \text{ ducats.}$$

Rule.—Multiply 182 10 by 118, price of exchange, and divide the product by 100 pezze.

$$\begin{array}{r} 182 \text{ } 10 \\ 118 \\ \hline 1456 \\ 182 \\ 182 \\ \hline \text{for 10 soldi} \dots \dots \dots 59 \end{array}$$

1,00)215,35(215 35 result.

See the proof of this operation, page 79.

NAPLES ON SICILY.

Reduce 1548 ounces 15 tarins into ducats and grains, at the exchange of 120 ducats di regno per 100 crowns.

Equation.

$$1548 \text{ } 15 = x$$

$$2 \text{ ounces} = 5 \text{ crowns}$$

$$100 \text{ crowns} = 120 \text{ ducats.}$$

Rule.—Multiply 1548 15 by 120, price of exchange, and divide the product by 40, fixed number.

$$\begin{array}{r} 1548 \text{ } 15 \\ 120 \\ \hline 30960 \\ 1548 \\ \hline \text{for 15 tarins} \dots \dots \dots 60 \end{array}$$

4,0)18582,0(4645 50 result.

$$\begin{array}{r} 25 \\ 18 \\ 22 \\ 2 \\ 100 \\ \hline 200 \\ 00 \end{array}$$

See the proof of this operation, page 100.

PETERSBURG AND RUSSIA.

Monies of Exchange, and Regulations.

A rouble = 10 grieveners or 100 copecs.

Accounts are kept in roubles and copecs.

There are no days of grace.

N. B. The Julian Calendar is still in use in Russia, and therefore 12 days must be added to the date of bills from Russia to make up the difference between the old and new style: for instance, a bill drawn on the 1st of September from Petersburg upon London at 100 days of date, becomes due, inclusive of the 3 days of grace, on the 24th of December.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	giv..... $31\frac{1}{2}$ pence sterling	for.....1 rouble.
Amsterdam	giv..... $29\frac{1}{2}$ stivers banco,	for.....1 ditto.
France	giv.....3 francs.....	for.....1 ditto.
Hamburg	giv..... $26\frac{1}{2}$ shillings lubs banco...	for.....1 ditto
Vienna	giv.....103 cruitzers	for.....1 ditto.

PETERSBURG ON LONDON.

Reduce 115 pounds 6 shillings 3 pence sterling into roubles and copecs, at the exchange of $31\frac{1}{2}$ pence sterling per rouble.

Equation. $115\ 6\ 3 = x$

1 pound = 240 pence

$31\frac{1}{2}$ pence = 1 rouble.

Rule.—Reduce 115 6 3 into pence, and divide the product by $31\frac{1}{2}$, price of exchange.

$31\frac{1}{2}$	115 6 3	63)55350(878 57 result.
2 fraction	20	495
—	—	540
63 div.	2306	36
	12	100
	—	—
	4615	3600
	2306	450
	—	9
	27675	
	2 fraction	
	—	
	55350	

To prove this operation, multiply 878 57 by $31\frac{1}{2}$, price of exchange, and divide the product by 240 pence.

PETERSBURG ON AMSTERDAM.

Reduce 422 florins 17 stivers 8 penings banco into roubles and copecs, at the exchange of $29\frac{1}{2}$ stivers banco per rouble.

Equation.

$$\begin{aligned} 422 \ 17 \ 8 &= x \\ 1 \text{ florin} &= 20 \text{ stivers} \\ 29\frac{1}{2} \text{ stivers} &= 1 \text{ rouble.} \end{aligned}$$

Rule.—Multiply 422 17 8 by 20 stivers, and divide the product by $29\frac{1}{2}$, price of exchange.

$$\begin{array}{r} 422 \ 17 \ 8 \\ 20 \\ \hline 8457\frac{1}{2} \\ 2 \text{ fraction} \\ \hline 59 \text{ div.} \end{array}$$

59)16915(286 69 result.

511

395

41

100

4100

560

29

To prove this operation, multiply 286 69 by $29\frac{1}{2}$, price of exchange, and divide the product by 20 stivers.

PETERSBURG ON HAMBURG.

Reduce 346 marcs 8 shillings lubs banco into roubles and copecs, at the exchange of $26\frac{3}{4}$ shillings lubs banco per rouble.

Equation.

$$\begin{aligned} 346 \ 8 &= x \\ 1 \text{ maro} &= 16 \text{ shillings} \\ 26\frac{3}{4} \text{ shillings} &= 1 \text{ rouble.} \end{aligned}$$

Rule.—Multiply 346 8 by 16 shillings, and divide the product by $26\frac{3}{4}$, price of exchange.

$$\begin{array}{r} 346 \ 8 \\ 16 \\ \hline 5544 \\ 4 \text{ fraction} \\ \hline 22176 \end{array} \quad \begin{array}{r} 107)22176(207 \ 25 \text{ result.} \\ 776 \\ 27 \\ 100 \\ \hline 2700 \\ 560 \\ 25 \\ \hline 22176 \end{array}$$

To prove this operation, multiply 207 25 by $26\frac{3}{4}$, price of exchange, and divide the product by 16 shillings.

PORTUGAL.

Monies of Exchange, and Regulations.

A crusade of exchange = 400 reis.

Accounts are kept in reis, and the three right hand figures are separated by a crossed cipher.

Value of usances for bills drawn from

England	30 days after sight.
France	60 days after date.
Amsterdam and Hamburg.....	2 months after date.
Italy	3 months after date.
Spain	15 days after sight.

N. B. Payments are made in Portugal in legal money (*moeda legal*), that is, one half in effective money, and the remainder in paper money.

Course of Exchange.

	Uncertain Prices.	Certain Prices.
London	giv.....66 pence sterling	for.....1000 reis.
Amsterdam.....	giv.....45 grotes Flemish	for.....1 crusade.
France.....	rec.....470 reis	for.....3 francs.
Genoa.....	rec.....764 reis	for.....1 pezza fuori di banco
Hamburg	giv.....43 grotes Flemish	for.....1 crusade.
Leghorn.....	rec.....810 reis	for.....1 pezza of 8 reals.
Naples	rec.....660 reis	for.....1 ducat di regno.
Spain.....	rec.....2350 reis	for.....1 pistole of exchange.
Venice	rec.....66 reis	for.....1 lira piccola.

PORTUGAL ON LONDON.

Reduce 147 pounds 12 shillings 6 pence sterling into reis, at the exchange of $62\frac{1}{2}$ pence sterling per milreis.

Equation.

$$147\ 12\ 6 = x$$

$$1\ \text{pound} = 240\ \text{pence}$$

$$62\frac{1}{2}\ \text{pence} = 1000\ \text{reis.}$$

Rule.—Reduce 147 12 6 into pence; multiply by 1000, and divide the product by $62\frac{1}{2}$, price of exchange.

$62\frac{1}{2}$	147 12 6	(125)70860000(566880 result
2 fraction	20	836
125 div.	2952	860
	12	1100
	5910	1000
	2952	00
	35430	
	1000	
	35430000	
	2 fraction	
	70860000	

See the proof of this operation, page 29.

PORTUGAL ON AMSTERDAM.

Reduce 753 florins 3 stivers 12 penings banco into reis, at the exchange of 45 grotes Flemish banco per crusade of 400 reis.

Equation. $753\ 3\ 12 = x$

1 florin = 40 grotes

45 grotes = 400 reis.

Rule.—Multiply 753 3 12 by 16000, fixed number, and divide the product by 45, price of exchange.

	753 3 12
	16000

	4518000
	753
for 2 stivers....	1600
for 1 ditto	800
for 12 penings ..	600

45)12051000(267800 result = 669 crusades 200 reis.

305

351

360

000

See the proof of this operation, page 36.

PORTUGAL ON FRANCE.

Reduce 885 francs 75 cents into reis, at the exchange of 460 reis for 3 francs.

Equation. $885\ 75 = x$

3 francs = 460 reis.

Rule.—Multiply 885 75 by 460, price of exchange, and divide the product by 3 francs.

	885 75
	460

	53100
	3540
for 50 cents	230
for 25 cents	115

3)407445(135815 results.

10

17

24

04

15

0

See the proof of this operation, page 58.

PORTUGAL ON GENOA.

Reduce 317 pezze 16 soldi 6 denari fuori di banco into reis, at the exchange of 720 reis per pezza of $5\frac{3}{4}$ lire fuori di banco.

Equation.

$$317\ 16\ 1 = x$$

$$1\ \text{pezza} = 720\ \text{reis.}$$

Rule.—Multiply 317 16 6 by 720, price of exchange.

	317 16 6
	720
	—
	6340
	2219
for 10 soldi....	360
for 5 ditto....	180
for 1 soldo ..	36
for 6 denari ..	18
	—

228834 result.

See the proof of this operation, page 68.

PORTUGAL ON HAMBURG.

Reduce 709 marcs 12 shillings lubs banco into reis, at the exchange of $42\frac{1}{2}$ grotes Flemish banco per crusade of 400 reis.

Equation.

$$709\ 12 = x$$

$$1\ \text{marc} = 32\ \text{grotes}$$

$$42\frac{1}{2}\ \text{grotes} = 400\ \text{reis.}$$

Rule.—Multiply 709 12 by 12800, fixed number, and divide the product by $42\frac{1}{2}$, price of exchange.

$42\frac{1}{2}$	709 12
2 fraction	12800
	—
85 div.	567200
	1418
	709
for 8 shillings..	6400
for 4 ditto	3200
	—

9084800

2 fraction

85)18169600(213760 result = 534 crusades 160 reis.

116

319

646

510

00

See the proof of this operation, page 74.

PORTUGAL ON LEGHORN.

Reduce 756 pezze 17 soldi 6 denari of 8 reals into reis, at the exchange of 840 reis per pezza of 8 reals.

Equation. $756\ 17\ 6 = x$
 1 pezza = 840 reis.

Rule.—Multiply 756 17 6 by 840, price of exchange.

$$\begin{array}{r} 756\ 17\ 6 \\ 840 \\ \hline 30240 \\ 6048 \end{array}$$

for 10 soldi.... 420

for 5 ditto.... 210

for 2 do. 6 den. 105

635775 result.

See the proof of this operation, page 79.

PORTUGAL ON SPAIN.

Reduce 450 dollars 3 reals 9 maravedis of plate into reis, at the exchange of 2256 reis per pistole of exchange.

Equation. $450\ 3\ 9 = x$
 4 dollars = 1 pistole
 1 pistole = 2256 reis.

Rule.—Multiply 450 3 9 by 2256 reis, and divide the product by 4 dollars.

$$\begin{array}{r} 450\ 3\ 9 \\ 2256 \\ \hline 2700 \\ 2250 \\ 900 \\ 900 \\ \hline \text{for 2 reals} \dots\dots\dots 564 \\ \text{for 1 real} \dots\dots\dots 282 \\ \text{for 9 maravedis} \dots\dots 74 \end{array}$$

4)1016120

254030 result.

See the proof of this operation, page 106.

PORTUGAL.

Reduction of effective money into legal money.

Reduce 6400 reis, effective money, into reis, legal money, at 13 per cent discount.

Equation.

$$6400 = x$$

$$93\frac{1}{2} \text{ reis effective} = 100 \text{ reis legal money.}$$

Rule.—Multiply 6400 by 100, and divide the product by $93\frac{1}{2}$, that is, by 100 less half the discount.

$93\frac{1}{2}$	6400	187)1280000(6844 $\frac{172}{187}$ result.
2 fraction	100	1580
187 div.	640000	840
	2 fraction	920
	1280000	172

See the proof of this operation below.

To understand the principle of this rule, we should observe that, as what is called the legal money is half effective money and half paper money, it follows, that, in making a payment in effective money, the whole discount which obtains upon paper money should be allowed upon one half of the sum paid, which is tantamount to calculating one half of the discount upon the whole sum.

PORTUGAL.

Reduction of legal money into effective money.

Reduce 6844 reis, legal money, into reis, effective money, at 13 per cent discount.

Equation.

$$6844 = x$$

$$100 \text{ reis legal money} = 93\frac{1}{2} \text{ reis effective money.}$$

Rule.—Multiply 6844 by $93\frac{1}{2}$, that is, by 100 less half the discount, and divide the product by 100.

	6844
	$93\frac{1}{2}$
	20532
	61596
for $\frac{1}{2}$	3422
for $\frac{172}{187}$, remainder of the	
preceding operation	86

$$1,00)6400,00(6400 \text{ result.}$$

See the proof of this operation above.

By the reason alluded to in the preceding operation, it is evident, that, to reduce legal money into effective money, only half of the discount is to be deducted.

PORTUGAL.

Reduction of paper money into legal money.

Reduce 126200 reis, paper money, into reis, legal money, at $8\frac{1}{2}$ per cent discount.

Equation.

$$126200 = x$$

$$100 \text{ reis paper money} = 91\frac{1}{2} \text{ reis effective money}$$

$$95\frac{3}{4} \text{ reis effective money} = 100 \text{ reis legal money.}$$

Rule.—Multiply 126200 by $91\frac{1}{2}$, that is, by 100 less the whole discount, and divide the product by $95\frac{3}{4}$, that is, by 100 less half the discount.

$95\frac{3}{4}$ 4 fraction 383 div.	$\begin{array}{r} 126200 \\ 91\frac{1}{2} \\ \hline 126200 \\ 1135800 \\ 63100 \\ \hline 11547300 \\ 4 \text{ fraction} \\ \hline 46189200 \end{array}$	$\begin{array}{r} 383)46189200(120598\frac{166}{83} \text{ result} \\ 788 \\ 2292 \\ 3770 \\ 3230 \\ 166 \end{array}$
---	---	---

See the proof of this operation as under.

By comparing, in this operation, 100 reis, paper money, with 100 reis effective, less the whole discount upon paper money, we reduce the sum into effective money; and by afterwards comparing 100 reis effective, less half the same discount, with 100 reis legal money, we complete the reduction of paper money into legal money.

Reduction of legal money into paper money.

Reduce 120598 reis, legal money, into reis, paper money, at $8\frac{1}{2}$ per cent discount.

Equation.

$$120598 = x$$

$$100 \text{ reis legal money} = 95\frac{3}{4} \text{ reis effective money}$$

$$91\frac{1}{2} \text{ reis effective money} = 100 \text{ reis paper money.}$$

Rule.—Multiply 120598 by $95\frac{3}{4}$, that is, by 100 less half the discount, and divide the product by $91\frac{1}{2}$, that is, by 100 less the total discount.

$91\frac{1}{2}$ 2 fraction 183 div.	$\begin{array}{r} 120598 \\ 95\frac{3}{4} \\ \hline 602990 \\ 1085382 \\ 60299 \\ 30149\frac{1}{2} \\ 41\frac{1}{2} \\ \hline 11547500 \\ 2 \text{ fraction} \\ \hline 23094600 \end{array}$	$\begin{array}{r} 183)23094600(126200 \text{ result} \\ 479 \\ 1134 \\ 366 \\ 000 \end{array}$
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for $\frac{1}{2}$ - - - - -
 for $\frac{1}{4}$ - - - - -
 for $\frac{1}{8}$ - - - - -
 for $\frac{1}{16}$ - - - - -
 for $\frac{1}{32}$ - - - - -
 for $\frac{1}{64}$ - - - - -
 for $\frac{1}{128}$ - - - - -
 for $\frac{1}{256}$ - - - - -
 for $\frac{1}{512}$ - - - - -
 for $\frac{1}{1024}$ - - - - -
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 for $\frac{1}{1285550435407192$

REVEL ON LONDON.

Monies of Exchange, and Regulations.

A rouble = 10 grieveners or 100 copecs.

Accounts are kept in roubles and copecs.

N. B. The old style is still used at Revel. See *Petersburg*.

Reduce 156 pounds 10 shillings sterling into roubles and copecs, at the exchange of 7 roubles 50 copecs per pound sterling.

Equation.

$$156\ 10 = x$$

$$1\ \text{pound} = 7\ \text{roubles}\ 50\ \text{copecs.}$$

Rule.—Multiply 156 10 by 7 50, price of exchange.

$$\begin{array}{r} 156\ 10 \\ 7\ 50 \\ \hline 1092 \\ \text{for 50 copecs} \dots 78 \\ \text{for 10 shillings} \dots 3\ 75 \end{array}$$

1173 75 result.

To prove this operation, divide 1173 75 by 7 50, price of exchange.

RIGA ON LONDON.

Monies of Exchange, and Regulations.

A rixdollar Albert = 90 groshen or 80 ferdings.

Accounts are kept in rixdollars and ferdings.

Reduce 347 pounds 17 shillings 6 pence sterling into rixdollars and ferdings, at the exchange of 408 groshen per pound sterling.

Equation.

$$347\ 17\ 6 = x$$

$$1\ \text{pound} = 408\ \text{groshen}$$

$$90\ \text{groshen} = 1\ \text{rixdollar.}$$

Rule.—Multiply 347 17 6 by 408, price of exchange, and divide the product by 90 groshen.

$$\begin{array}{r} 347\ 17\ 6 \\ 408 \\ \hline 2776 \\ 13880 \\ \text{for 10 shillings} \dots 204 \\ \text{for 5 ditto} \dots 102 \\ \text{for 2 do. 6 pence} \dots 51 \\ \hline 141933 \end{array} \quad \begin{array}{r} 90)141933(1577\ 2\ \text{result} \\ 519 \\ 693 \\ 633 \\ 3 \\ 80 \\ 240 \\ 60 \end{array}$$

To prove this operation, multiply 1577 2 by 90 groshen, and divide the product by 408, price of exchange.

ROME.

Monies of Exchange, and Regulations.

A crown current (*scudo moneta*) = 10 paoli or 100 bajocchi.

A gold crown (*scudo di stampa de oro*) = 20 soldi = 240 denari or $152\frac{3}{10}$ bajocchi.

1000 gold crowns = 1523 crowns current.

Accounts are kept in crowns current and bajocchi.

There are no days of grace.

Course of Exchange.

	Uncertain Prices.	Certain Prices.
London	giv.....51 pence sterling.....for...1 crown current.	
Idem	rec.....48 paoli.....for...1 pound sterling.	
Amsterdam	rec.....44 bajocchi.....for...1 florin banco.	
France	giv.....105 sols in francs.....for...1 crown current.	
Genoa	giv.....124 soldi fuori di banco.....for...1 crown current.	
Hamburg	rec.....37 bajocchi.....for...1 marc lubs banco.	
Leghorn	rec.....98 bajocchi.....for...1 pezza of 8 reals.	
Lisbon	giv.....1220 reis.....for...1 gold crown.	
Milan	rec.....81 gold crowns.....for...100 crowns.	
Naples	giv.....122 ducats di regno.....for...100 crowns current.	
Spain	giv.....560 maravedis of plate.....for...1 gold crown.	
Idem	giv.....112 reals ditto.....for...10 crowns current.	

ROME ON LONDON.

Reduce 1236 pounds 12 shillings 6 pence sterling into crowns current and bajocchi, at the exchange of 52 pence sterling per crown current.

Equation.

$$1236 \ 12 \ 6 = x$$

$$1 \text{ pound} = 240 \text{ pence}$$

$$52 \text{ pence} = 1 \text{ crown.}$$

Rule.—Reduce 1236 12 6 into pence, and divide the product by 52, price of exchange.

1236 12 6	52)296790(5707 50 result
20	367
24732	390
12	26
49470	100
24732	2600
296790	00

To prove this operation, multiply 5707 50 by 52, price of exchange, and divide the product by 240 pence.

H

SICILY.

Monies of Exchange, and Regulations.

An ounce (*onza*) = 30 tarins or 600 grains.

A tarin..... = 2 carlins or 20 grains.

A crown (*scudo*) = 12 tarins or 240 grains.

5 crowns = 2 ounces.

Accounts are kept in ounces, tarins, and grains.

There are no days of grace.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	rec.....59 tarins.....	for.....1 pound sterling.
Amsterdam	rec.....5½ tarins.....	for.....1 florin banco.
France	rec.....50 grains	for.....1 franc.
Genoa	rec.....40 grains	for.....1 lira fuori di banco.
Leghorn	rec.....12½ tarins	for.....1 pezza of 8 reals.
Naples	giv.....120 ducats di regno	for.....100 crowns.
Portugal	rec.....6¼ tarins.....	for.....1 crusade of 400 reis.
Rome.....	rec.....12½ tarins	for.....1 crown current.
Spain	rec.....8¼ tarins	for.....1 dollar of exchange

SICILY ON LONDON.

Reduce 546 pounds 17 shillings 6 pence sterling into ounces, tarins, and grains, at the exchange of 58 tarins per pound sterling.

Equation.

$$546 \ 17 \ 6 = x$$

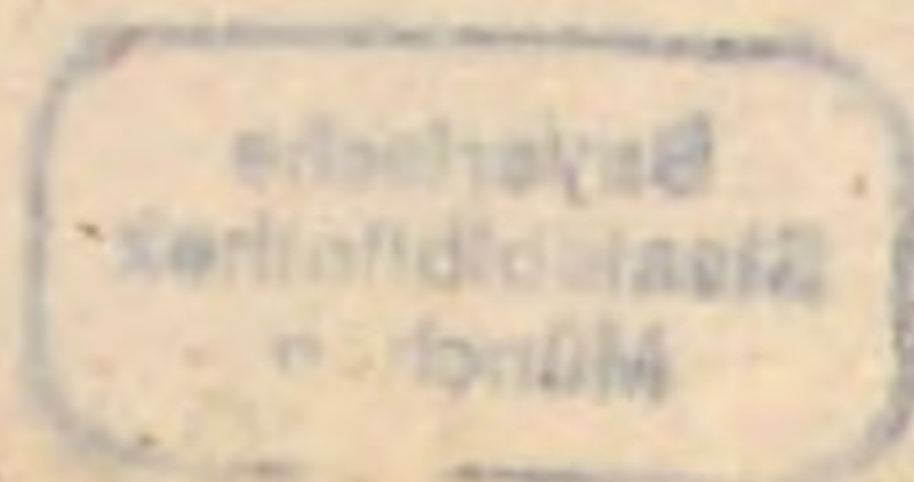
$$1 \text{ pound} = 58 \text{ tarins}$$

$$30 \text{ tarins} = 1 \text{ ounce.}$$

Rule.—Multiply 546 17 6 by 58, price of exchange, and divide the product by 30 tarins.

	546 17 6	30)31718 22 10(1057 8 15 result
	58	171
		218
	4368	8
	2730	30
for 10 shillings ..	29	
for 5 ditto	14 15	262
for 2 do. 6 pence	7 7 10	22
		20
	31718 22 10	
		450
		150
		0

To prove this operation, multiply 1057 8 15 by 30 tarins, and divide the product by 58, price of exchange.



SICILY ON GENOA.

Reduce 6742 lire 10 soldi fuori di banco into ounces, tarins, and grains, at the exchange of 41 grains per lira fuori di banco.

Equation.

$$6742 \text{ 10} = x$$

$$1 \text{ lira} = 41 \text{ grains}$$

$$600 \text{ grains} = 1 \text{ ounce.}$$

Rule.—Multiply 6742 10 by 41, price of exchange, and divide the product by 600 grains.

6742 10		600)276442 $\frac{1}{2}$ (460 22 2 result
41		3644
—		442
6742		30
26968		—
for 10 soldi 20 $\frac{1}{2}$		13275
—		1275
276442 $\frac{1}{2}$		75
		20
		—
		1500
		300

To prove this operation, multiply 460 22 2 by 600 grains, and divide the product by 41, price of exchange.

SICILY ON LEGHORN.

Reduce 3941 pezze 13 soldi 4 denari of 8 reals into ounces and tarins, at the exchange of 12 tarins per pezza of 8 reals.

Equation.

$$3941 \text{ 13 4} = x$$

$$1 \text{ pezza} = 12 \text{ tarins}$$

$$30 \text{ tarins} = 1 \text{ ounce.}$$

Rule.—Multiply 3941 13 4 by 12, price of exchange, and divide the product by 30 tarins.

3941 13 4		30)47300(1576 20 result
12		173
—		230
7882		200
3941		20
for 10 soldi 6		
for 3 ditto 4 den. 2		
—		
47300		

See the proof of this operation, p. 80.

SICILY ON NAPLES.

Reduce 4645 ducats 50 grains into ounces and tarins, at the exchange of 120 ducats di regno for 100 crowns.

Equation. $4645\ 50 = x$
 $120\text{ ducats} = 100\text{ crowns}$
 $5\text{ crowns} = 2\text{ ounces.}$

Rule.—Multiply 4645 50 by 40, fixed number, and divide the product by 120, price of exchange.

4645 50	12,0)	18582,0	(1548 15 result
40		658	
		58	
185800		102	
for 50 grains 20		6	
		30	
185820		180	
		60	
		0	

See the proof of this operation, page 87.

 SPAIN.
Monies of Exchange.

A dollar of exchange (*peso de cambio*) = 8 reals of plate = 15 reals 2 maravedis of vellon = 272 maravedis of plate = 512 maravedis of vellon = 10 reals of Valencia, or 1 libra 8 sueldos catalanes.

A pistole of exchange (*doblon de cambio*) = 4 dollars of exchange = 32 reals of plate = 1088 maravedis of plate = 2048 maravedis of vellon = 40 reals of Valencia, or 5 libras 12 sueldos catalanes.

A ducat of exchange (*ducado de cambio*) = 375 maravedis of plate, or $705\frac{1}{4}$ maravedis of vellon.

An escudo de oro = 5 dollars of exchange = 40 reals of plate, or 75 reals 10 maravedis of vellon.

A dollar, and a ducat, of exchange, are each divided into 20 sueldos, and a sueldo into 12 dineros.

A real of plate and a real of vellon are each divided into 34 maravedis.

272 ducats of exchange..	=	375 dollars of exchange.
272 ditto	=	525 libras catalanes.
280 ditto	=	6000 reals of vellon.
85 dollars of exchange..	=	64 hard dollars.
5 ditto	=	7 libras catalanes.
17 ditto	=	256 reals of vellon.
17 escudos de oro	=	1280 ditto.
17 pistoles of exchange .	=	1024 ditto.
34 reals of plate	=	64 ditto.

SPAIN.

Regulations.

Accounts are kept at Cadiz and Seville in reals and maravedis of plate; at Madrid, Malaga, Bilboa, and St. Sebastian, in reals and maravedis of vellon; at Valencia, in pesos, sueldos, and dineros; and at Barcelona, in libras, sueldos, and dineros.

At Madrid and Seville, the value of usance for bills drawn from England, France, and Italy, is 60 days after date; from Amsterdam and Hamburg, 2 months after date; and there are 14 days of grace allowed only for bills accepted.

At Cadiz, the value of usance for bills drawn from France is 1 month after date, and from other countries 60 days after date. There are 6 days of grace.

At Bilboa, the value of usance for bills drawn from France is 1 month, and from other countries 2 months after date. There are 14 days of grace.

N. B. By the regulation of the Board of Trade, "*Consulado*," No. 26, Chapter 13, those merchants in Spain receiving firsts of bills of exchange, for acceptance, the seconds of which may not have been presented till after the firsts may have become due, are required, under their own responsibility, to cause the amount of such bills to be deposited by the parties drawn upon, in order to be transferred, at a future time, to the holders of the seconds. The merchants who may have procured the acceptance have then a right to one half per cent upon the amount of the deposit, which is paid to them by the holders of the seconds.

Course of Exchange.

<i>Uncertain Prices.</i>		<i>Certain Prices.</i>
London	giv 36 pence sterling	for 1 dollar of exchange.
Amsterdam	giv 88 grotes Flemish	for 1 ducat of exchange.
France	giv 15 livres tournois in francs	for 1 pistole of exchange.
Idem	giv 76 sols tournois	for 1 dollar of exchange.
Genoa	rec 127 dollars of exchange	for 100 pezze fuori di banco.
Idem	giv 22 lire fuori di banco	for 1 escudo de oro.
Hamburg	giv 84 grotes Flemish	for 1 ducat of exchange.
Leghorn	rec 136 dollars of exchange	for 100 pezze of 8 reals.
Naples	rec 315 maravedis of plate	for 1 ducat di regno.
Portugal	giv 2300 reis	for 1 pistole of exchange.

Vales Reales presently circulating in Spain, by an order of the government, in date of the 30th August 1800, are of three different issues or creations. They bear an interest of 4 per cent per annum; and their intrinsic value, independently of the interest which may be due upon them, is as follows :

	Dollars.	Reals	Maravedis
Vales Reales for 600 are worth	9035	10	of vellon.
.....300.....	4517	22	ditto
.....150.....	2258	28	ditto.

The paper money in question is only transferable by indorsement, and it is required by law that it be received in payment to the full amount of its nominal value. As, however, it experiences a greater or less depreciation, it is necessary, in drawing upon Spain for effective money, to insert the words "*payable in effective*" in the body of the bill, which might otherwise be paid in vales.

SPAIN ON LONDON.

Reduce 391 pounds 1 shilling 3 pence sterling into dollars, reals, and maravedis of plate, at the exchange of $35\frac{1}{2}$ pence sterling per dollar of exchange.

Equation.

$$391 \ 1 \ 3 = x$$

$$1 \text{ pound} = 240 \text{ pence}$$

$$35\frac{1}{2} \text{ pence} = 1 \text{ dollar.}$$

Rule.—Multiply 391 1 3 into pence, and divide the product by $35\frac{1}{2}$, price of exchange.

$35\frac{1}{2}$	391 1 3	71)187710(2643 6 14 result.
2 fraction	20	457
		311
71 div.	7821 3	270
	12	57
		8
	15645	
	7821	456
		30
	93855	34
	2 fraction	
		1020
	187710	310
		26

See the proof of this operation, page 30.

SPAIN ON AMSTERDAM.

Reduce 640 florins banco into dollars, reals, and maravedis of plate, at the exchange of 88 grotes Flemish banco per ducat of exchange.

Equation.

$$\begin{aligned} 640 &= x \\ 1 \text{ florin} &= 40 \text{ grotes} \\ 88 \text{ grotes} &= 1 \text{ ducat} \\ 272 \text{ ducats} &= 375 \text{ dollars.} \end{aligned}$$

Rule.—Multiply 640 by 1875, fixed number; divide the product by 34, fixed number, multiplied by 88, price of exchange.

34	640	2992)1200000(401 0 18 result
88	1875	3200
—	—	208
272	3200	8
272	4480	—
—	5120	1664
2992 div.	640	34
	—	—
	1200000	6656
		4992
		—
		56576
		26656
		2720

To prove this operation, multiply 401 0 18 by 88, price of exchange, and by 34, fixed number; divide the product by 1875, fixed number.

SPAIN ON FRANCE.

Reduce 2702 livres 14 sols tournois into dollars and reals of plate, at the exchange of 14 livres 8 sols tournois per pistole of exchange.

Equation.

$$\begin{aligned} 2702 \text{ 14} &= x \\ 14 \text{ livres 8 sols} &= 1 \text{ pistole} \\ 1 \text{ pistole} &= 4 \text{ dollars.} \end{aligned}$$

Rule.—Multiply 2702 14 by 4 dollars, and divide the product by 14 8, price of exchange.

14 8	2702 14	288)216216(750 6 result
20 fraction	4	1461
—	—	216
288 div.	10808	8
for 10 sols.....	2	—
for 4 ditto.....	16	1728
	—	0
	10810 16	
	20 fraction	
	—	
	216216	

See the proof of this operation, page 58.

SPAIN ON FRANCE.

Reduce 1105 livres 11 sols 3 deniers tournois into dollars, reals, and maravedis of plate, at the exchange of 76 sols tournois per dollar of exchange.

Equation.

$$\begin{array}{lcl} 1105 \text{ 11 3} & = & x \\ 1 \text{ livre} & = & 20 \text{ sols} \\ 76 \text{ sols} & = & 1 \text{ dollar.} \end{array}$$

Rule.—Multiply 1105 11 3 by 20 sols, and divide the product by 76, price of exchange.

$$\begin{array}{r} 1105 \text{ 11 3} \quad 76)22111\frac{1}{4}(290 \text{ 7 17 result} \\ \underline{20} \quad \quad \quad 691 \\ \quad \quad \quad 71 \\ \quad \quad \quad \underline{8} \\ \quad \quad \quad 570 \\ \quad \quad \quad \underline{38} \\ \quad \quad \quad 34 \\ \quad \quad \quad \underline{152} \\ \quad \quad \quad 114 \\ \quad \quad \quad \underline{1292} \\ \quad \quad \quad 532 \\ \quad \quad \quad \underline{0} \end{array}$$

See the proof of this operation, page 59.

SPAIN ON GENOA.

Reduce 192 pezze 14 soldi 2 denari fuori di banco into dollars, reals, and maravedis of plate, at the exchange of 126 dollars of exchange for 100 pezze of 5½ lire fuori di banco.

Equation.

$$\begin{array}{lcl} 192 \text{ 14 2} & = & x \\ 100 \text{ pezze} & = & 126 \text{ dollars.} \end{array}$$

Rule.—Multiply 192 14 2 by 126, price of exchange, and divide the product by 100 pezze.

$$\begin{array}{r} 192 \text{ 14 2} \quad 1,00)242,81\frac{1}{4}(242 \text{ 6 17 result} \\ \underline{126} \quad \quad \quad 8 \\ \quad \quad \quad 1152 \\ \quad \quad \quad 384 \\ \quad \quad \quad 192 \\ \text{for 10 soldi} \dots\dots\dots 63 \\ \text{for 4 ditto} \dots\dots\dots 25 \quad 4 \\ \text{for 2 denari} \dots\dots\dots 1 \quad 1 \\ \hline 24281\frac{1}{4} \end{array}$$

To prove this operation, multiply 242 6 17 by 100 pezze, and divide the product by 126, price of exchange.

SPAIN ON HAMBURG.

Reduce 854 marcs 4 shillings lubs banco into dollars of plate, at the exchange of $83\frac{3}{4}$ grotes Flemish banco per ducat of exchange.

Equation.

$$854\ 4 = x$$

$$1\ \text{marc} = 32\ \text{grotes}$$

$$83\frac{3}{4}\ \text{grotes} = 1\ \text{ducat}$$

$$272\ \text{ducats} = 375\ \text{dollars.}$$

Rule.—Multiply 854 4 by 750, fixed number; divide the product by 17, fixed number, and by $83\frac{3}{4}$, price of exchange.

$\begin{array}{r} 17 \\ 83\frac{3}{4} \\ \hline 51 \\ 136 \\ \text{for } \frac{3}{4} \dots 12\frac{3}{4} \\ \hline 1423\frac{3}{4} \\ 4\ \text{fraction} \\ \hline 5695\ \text{div.} \end{array}$	$\begin{array}{r} 854\ 4 \\ 750 \\ \hline 42700 \\ 5978 \\ \text{for 4 shill. } 187\frac{1}{2} \\ \hline 640687\frac{1}{2} \\ 4\ \text{fraction} \\ \hline 5695)2562750(450\ \text{result.} \\ 28475 \\ 00 \end{array}$
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To prove this operation, multiply 450 by 17, fixed number, and by $83\frac{3}{4}$, price of exchange; divide the product by 750, fixed number.

SPAIN ON LEGHORN.

Reduce 240 pezze 12 soldi 6 denari of 8 reals into dollars and reals of plate, at the exchange of 136 dollars of exchange per 100 pezze of 8 reals.

Equation.

$$240\ 12\ 6 = x$$

$$100\ \text{pezze} = 136\ \text{dollars.}$$

Rule.—Multiply 240 12 6 by 136, price of exchange, and divide the product by 100 pezze.

$\begin{array}{r} 240\ 12\ 6 \\ 136 \\ \hline 1440 \\ 720 \\ 240 \\ \text{for 10 soldi} \dots \dots \dots 68 \\ \text{for 2 do. 6 den.} \dots \dots 17 \\ \hline 32725 \end{array}$	$\begin{array}{r} 1,00)327,25(327\ 2\ \text{result.} \\ 8 \\ \hline 2,00 \end{array}$
---	---

See the proof of this operation, page 80.

SPAIN ON PORTUGAL.

Reduce 254030 reis into dollars, reals, and maravedis of plate, at the exchange of 2256 reis per pistole of exchange.

Equation.

$$\begin{array}{lcl} 254030 & = & x \\ 2256 \text{ reis} & = & 1 \text{ pistole} \\ 1 \text{ pistole} & = & 4 \text{ dollars.} \end{array}$$

Rule.—Multiply 254030 by 4 dollars, and divide the product by 2256, price of exchange.

$$\begin{array}{r} 254030 \\ \times 4 \\ \hline 1016120 \end{array} \quad \begin{array}{r} 2256)1016120(450 \text{ 3 8 result.} \\ 11372 \\ 920 \\ 8 \\ \hline 7360 \\ 592 \\ 84 \\ \hline 2368 \\ 1776 \\ \hline 20128 \\ 2080 \end{array}$$

See the proof of this operation, page 93.

SPAIN.

Reduction of reals of plate into reals of vellon.

Reduce 42602 reals 17 maravedis of plate into reals and maravedis of vellon.

Equation.

$$42602 \text{ 17} = x$$

$$34 \text{ reals of plate} = 64 \text{ reals of vellon.}$$

Rule.—Multiply 42602 17 by 64, and divide the product by 34.

$$\begin{array}{r} 42602 \text{ 17} \\ \times 64 \\ \hline 170408 \\ 255612 \\ \hline 2726560 \end{array} \quad \begin{array}{r} 34)2726560(80192 \text{ 32 result.} \\ 065 \\ 316 \\ 100 \\ 32 \end{array}$$

N. B. Always place the remainder in the quotient as so many maravedis, since its multiplication by 34 and division by the same number cannot occasion any alteration.

Dollars of exchange are reduced into reals of plate by multiplying by 8.

See the proof of this operation in the following page.

SPAIN.

Reduction of reals of vellon into reals of plate.

Reduce 80192 reals 32 maravedis of vellon into reals and maravedis of plate.

Equation. $80192\ 32 = x$
 64 reals of vellon = 34 reals of plate.

Rule.—Multiply 80192 32 by 34, and divide the product by 64.

80192 32	64)	2726560	(42602 17 result.
34		166	
		385	
320768		160	
240576		32	
for 32 maravedis.. 32		34	
		128	
2726560		96	
		1088	
		448	
		0	

N. B. Always bring down the maravedis in the product, by the reason alluded to in the preceding page.

See the proof of this operation in the preceding page.

SPAIN.

Reduction of ducats of exchange into dollars of exchange.

Reduce 795 ducats 14 sueldos 8 dineros of exchange into dollars, reals, and maravedis of plate.

Equation. $795\ 14\ 8 = x$
 272 ducats = 375 dollars.

Rule.—Multiply 795 14 8 by 375, and divide the product by 272.

795 14 8	272)	298400	(1097 0 16 result.
375		2640	
		1920	
3975		16	
5565		8	
2385		128	
for 10 sueldos..... 187½		34	
for 4 ditto..... 75		512	
for 8 dineros..... 12½		384	
		4352	
298400		1632	
		0	

See the proof of this operation in the following page.

SPAIN.

Reduction of dollars of exchange into ducats of exchange.

Reduce 1097 dollars 16 maravedis of plate into ducats, sueldos, and dineros of exchange.

Equation.

$$1097 \text{ } 0 \text{ } 16 = x$$

$$375 \text{ dollars} = 272 \text{ ducats.}$$

Rule.—Multiply 1097 0 16 by 272, and divide the product by 375.

1097 0 16	375)298400	(795 14 8 result.
272	3590	
—	2150	
2194	275	
7679	20	
2194	—	
for 16 maravedis... 16	5500	
—	1750	
298400	250	
	12	
	—	
	500	
	250	
	—	
	3000	
	0	

See the proof of this operation in the preceding page.

SPAIN.

Reduction of vales reales into effective money.

Reduce 19036 reals 17 maravedis vales reales into reals and maravedis effective money, at 48 per cent discount.

Equation.

$$19036 \text{ } 17 = x$$

$$100 \text{ reals vales} = 52 \text{ reals effective.}$$

Rule.—Multiply 19036 17 by 52, that is, by 100 less the discount, and divide the product by 100.

19036 17	1,00)9898,98	(9898 33 result.
52	34	
—	—	
38072	392	
95180	204	
for 17 maravedis.... 26	—	
—	33,32	
989898		

See the proof of this operation in the following page.

SPAIN.

Reduction of effective money into vales reales.

Reduce 9898 reals 33 maravedis effective money into reals and maravedis vales reales, at 48 per cent discount.

Equation. $9898\ 33 = x$
 $52\ \text{reals effective} = 100\ \text{reals vales.}$

Rule.—Multiply 9898 33 by 100, and divide the product by 52, that is, by 100 less the discount.

9898 33	52)	989897 2	(19036 16 result.
100		469	
		189	
989800		337	
for 17 maravedis.... 50		25	
for 16 ditto..... 47 2		34	
		102	
989897 2		75	
		852	
		332	
		20	

See the proof of this operation in the preceding page.

STOCKHOLM AND GOTTENBURG.

Monies of Exchange, and Regulations.

A rixdollar specie.. = 48 skillings.

A skilling..... = 12 fenings.

Accounts are kept in rixdollars, skillings, and fenings.

The value of usance is 1 month after acceptance.

There are 6 days of grace, which are not allowed for bills at sight.

Course of Exchange.

	<i>Uncertain Prices,</i>	<i>Certain Prices.</i>
London	rec..... $4\frac{1}{2}$ rixdollars	for... 1 pound sterling.
Amsterdam	rec..... 44 skillings	for... 1 rixdollar banco.
Copenhagen	rec..... 36 skillings	for... 1 rixdollar.
Dantzic	rec..... $9\frac{1}{2}$ skillings	for... 1 florin current.
France	rec..... 24 skillings	for... 3 francs.
Hamburg	rec..... 47 skillings	for... 1 rixdollar banco.
Leghorn	rec..... 40 skillings	for... 1 pezza of 8 reals.
Lisbon	rec..... 21 skillings	for... 1 crusade of 400 reis.
Spain	rec..... 42 skillings	for... 1 ducat of exchange.

STOCKHOLM ON LONDON.

Reduce 328 pounds 17 shillings 6 pence sterling into rixdollars and skillings, at the exchange of $4\frac{1}{2}$ rixdollars per pound sterling.

Equation. $328\ 17\ 6 = x$

1 pound = $4\frac{1}{2}$ rixdollars.

Rule.—Multiply 328 17 6 by $4\frac{1}{2}$, price of exchange.

	328 17 6
	$4\frac{1}{2}$
	1312
for $\frac{1}{2}$	164
for 10 shillings	2 12
for 5 ditto	1 6
for 2 do. 6 pence ..	27

1479 45 result.

To prove this operation, divide 1479 45 by $4\frac{1}{2}$, price of exchange.

STOCKHOLM ON AMSTERDAM.

Reduce 587 florins 17 stivers 8 penings banco into rixdollars, skillings, and fenings, at the exchange of 44 skillings per rixdollar banco.

Equation. $587\ 17\ 8 = x$

$2\frac{1}{2}$ florins = 1 rixdollar

1 rixdollar = 44 skillings

48 skillings = 1 rixdollar.

Rule.—Multiply 587 17 8 by 44, price of exchange, and divide the product by 120, fixed number.

	587 17 8	120)25866 $\frac{1}{2}$ (215 26 7 result
	44	186
		666
	2348	66
	2348	48
for 10 stivers	22	
for 7 do. 8 penings	16 $\frac{1}{2}$	552
		264
	25866 $\frac{1}{2}$	
		3192
		792
		72
		12
		864
		24

To prove this operation, multiply 215 26 7 by 120, fixed number, and divide the product by 44, price of exchange.

STOCKHOLM ON HAMBURG.

Reduce 786 marcs 12 shillings lubs banco into rixdollars, skillings, and fenings, at the exchange of 46 skillings for 1 rixdollar banco.

Equation.

$$786\ 12 = x$$

$$3\ \text{marcs} = 1\ \text{rixdollar}$$

$$1\ \text{rixdollar} = 46\ \text{skillings}$$

$$48\ \text{skillings} = 1\ \text{rixdollar.}$$

Rule.—Multiply 786 12 by 46, price of exchange, and divide the product by 144, fixed number.

786 12	144	36190½	(251 15 6 result
46		739	
—		190	
4716		46	
3144		48	
for 12 shillings .. 34½		—	
		392	
		184	
		—	
		2232	
		792	
		72	
		12	
		—	
		864	
		0	

To prove this operation, multiply 251 15 6 by 144, fixed number, and divide the product by 46, price of exchange.

SWITZERLAND.

Monies of Exchange, and Regulations.

A crown or rixdollar = 3 livres = 1½ florin or 108 cruizers.

A livre = 20 sols or 36 cruizers.

A sol = 6 deniers.

A florin = 33½ sols or 60 cruizers.

A cruizer = 5 penins.

5 rixdollars of exchange = 9 florins of exchange.

3 florins ditto = 5 livres ditto.

2 ditto = 5 livres tournois.

81 ditto = 200 francs.

2 livres of exchange = 3 livres tournois.

27 ditto = 40 francs.

Accounts are kept in livres, sols, and deniers of exchange, and in florins and cruizers of exchange.

Bills are generally drawn upon Switzerland at so many days after date, or after sight.

There are no days of grace.

SWITZERLAND.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	rec.....16 livres	for.....1 pound sterling.
Amsterdam	rec.....152 livres	for.....100 florins banco.
Idem.....	rec.....143 livres	for.....100 florins current.
Augsburg	rec.....172 livres	for.....100 guldens current.
France	rec.....99 francs	for.....100 francs.
Francfort	rec.....98 florins	for.....100 guldens current.
Genoa	rec.....64½ sols	for.....1 pezza fuori di banco.
Hamburg.....	rec.....127 livres	for.....100 marcs lubs banco.
Leghorn	rec.....68 sols	for.....1 pezza of 8 reals.
Milan	rec.....51½ livres	for.....100 lire current.
Vienna.....	rec.....130 livres	for.....100 guldens.

N. B. Switzerland exchanges by exchange money, 9 pieces of which are equivalent with 10 pieces current money.

The exchange between France and Switzerland is at so much per cent.

SWITZERLAND ON LONDON.

Reduce 188 pounds 7 shillings 6 pence sterling into livres, sols, and deniers, at the exchange of 16 livres 4 sols per pound sterling.

Equation. 188 7 6 = x

1 pound = 16 livres 4 sols.

Rule.—Multiply 188 7 6 by 16 4, price of exchange.

$$\begin{array}{r}
 188 \quad 7 \quad 6 \\
 16 \quad 4 \\
 \hline
 1128 \\
 188 \\
 \hline
 \text{for 4 sols} \dots\dots\dots 37 \quad 12 \\
 \text{for 5 shillings} \dots\dots\dots 4 \quad 1 \\
 \text{for 2 ditto 6 pence} \dots\dots\dots 2 \quad 0 \quad 6 \\
 \hline
 3051 \quad 13 \quad 6 \text{ result.}
 \end{array}$$

To prove this operation, divide 3051 13 6 by 16 4, price of exchange.

SWITZERLAND ON AMSTERDAM.

Reduce 365 florins 15 stivers banco into livres, sols, and deniers, at the exchange of 152 livres 10 sols for 100 florins banco.

Equation. $365\ 15 = x$
 $100\ \text{florins} = 152\ \text{livres}\ 10\ \text{sols}.$

Rule.—Multiply 365 15 by 152 10, price of exchange, and divide the product by 100 florins.

	365 15	1,00)557,76 17 6(557 15 4 result
	152 10	20
	730	15,37
	1825	12
	365	
for 10 sols.....	182 10	80
for 10 stivers ..	76 5	37
for 5 ditto	38 2 6	
		4,50
	55776 17 6	

To prove this operation, multiply 557 15 4 by 100 florins, and divide the product by 152 10, price of exchange.

SWITZERLAND ON HAMBURG.

Reduce 213 marcs 17 shillings 6 fenings lubs banco into livres, sols, and deniers, at the exchange of 128 livres for 100 marcs lubs banco.

Equation. $213\ 17\ 6 = x$
 $100\ \text{marcs} = 128\ \text{livres}.$

Rule.—Multiply 213 17 6 by 128, price of exchange, and divide the product by 100 marcs.

	213 17 6	1,00)273,76(273 15 2 result
	128	20
	1704	15,20
	426	12
	213	
for 10 shillings....	64	2,40
for 5 ditto	32	
for 2 do. 6 fenings ..	16	
	27376	

To prove this operation, multiply 273 15 2 by 100 marcs, and divide the product by 128, price of exchange.

TRIESTE.

Monies of Exchange, and Regulations.

A rixdollar = $1\frac{1}{2}$ gulden or 60 cuitzers.

A gulden = 60 cuitzers or 240 fenings.

Accounts are kept in gulden and cuitzers.

Course of Exchange.

	Uncertain Prices.	Certain Prices.
London	rec.....12 gulden	for.....1 pound sterling.
Amsterdam	rec.....177 rixdollars	for.....100 rixdollars current.
Augsburg	rec.....130 gulden	for.....100 gulden.
Constantinople	rec.....75 gulden	for.....100 piastres.
France.....	rec.....30 cuitzers	for.....1 franc.
Genoa	giv.....47 soldi fuori di banco	for.....1 gulden.
Hamburg.....	rec.....194 gulden	for.....200 marcs lubs banco.
Leghorn	rec.....2 $\frac{1}{2}$ gulden	for.....1 pezza of 8 reals.
Milan	giv.....51 soldi current	for.....1 gulden.
Naples	giv.....45 grains	for.....1 gulden.
Rome	rec.....2 $\frac{1}{2}$ gulden	for.....1 crown current.
Sicily	rec.....6 $\frac{1}{2}$ gulden	for.....1 ounce.
Venice	giv.....114 soldi piccoli	for.....1 gulden.

TRIESTE ON LONDON.

Reduce 896 pounds 17 shillings 6 pence sterling into gulden and cuitzers, at the exchange of 12 gulden 15 cuitzers per pound sterling.

Equation.

$$896 \ 17 \ 6 = x$$

$$1 \text{ pound} = 12 \text{ gulden } 15 \text{ cuitzers.}$$

Rule.—Multiply 896 17 6 by 12 15, price of exchange.

	896 17 6
	12 15
	—
	1792
	896
for 15 cuitzers	224
for 10 shillings	6 7 $\frac{1}{8}$
for 5 ditto.....	3 3 $\frac{5}{8}$
for 2 do. 6 pence ..	1 31 $\frac{7}{8}$

10986 43 $\frac{1}{8}$ result.

To prove this operation, divide 10986 43 $\frac{1}{8}$ by 12 15, price of exchange.

TRIESTE ON GENOA.

Reduce 985 pezze 10 soldi fuori di banco into guldens and cruitzers, at the exchange of 47 soldi fuori di banco per gulden.

Equation.

$$\begin{array}{l} 985 \text{ } 10 = x \\ 1 \text{ pezza} = 115 \text{ soldi} \\ 47 \text{ soldi} = 1 \text{ gulden.} \end{array}$$

Rule.—Multiply 985 10 by 115 soldi, and divide the product by 47, price of exchange.

	985 10	47)113332½(2411 19 result
	115	193
	—	53
	4925	62
	985	15
	985	60
for 10 soldi.....	57½	—
	—	930
	113332½	460
		37

To prove this operation, multiply 2411 19 by 47, price of exchange, and divide the product by 115 soldi.

TRIESTE ON LEGHORN.

Reduce 1236 pezze 17 soldi 6 denari of 8 reals into guldens and cruitzers, at the exchange of 2 guldens 40 cruitzers per pezza of 8 reals.

Equation.

$$\begin{array}{l} 1236 \text{ } 17 \text{ } 6 = x \\ 1 \text{ pezza} = 2 \text{ guldens } 40 \text{ cruitzers.} \end{array}$$

Rule.—Multiply 1236 17 6 by 2 40, price of exchange.

	1236 17 6	
	2 40	
	—	
	2472	
for 20 cruitzers....	412	
for 20 ditto	412	
for 10 soldi	1 20	
for 5 ditto	40	
for 2 ditto 6 den...	20	
	—	
	3298 20 result.	

To prove this operation, divide 3298 20 by 2 40, price of exchange.

TRIESTE ON NAPLES.

Reduce 1538 ducats 75 grains di regno into guldens and cruitzers, at the exchange of 45 grains per gulden.

Equation. $1538\ 75 = x$

1 ducat = 100 grains

45 grains = 1 gulden.

Rule.—Multiply 1538 75 by 100 grains, and divide the product by 45, price of exchange.

$$\begin{array}{r}
 1538\ 75 \\
 100 \\
 \hline
 45)153875(3419\ 26\ \text{result} \\
 \underline{88\ 188} \\
 20\ 87 \\
 \underline{61\ 425} \\
 60\ 20 \\
 \underline{60} \\
 028 \\
 \underline{000} \\
 75\ 300 \\
 \underline{30}
 \end{array}$$

To prove this operation, multiply 3419 26 by 45, price of exchange, and divide the product by 100 grains.

TURIN.

Monies of Exchange, and Regulations.

A lira = 20 soldi or 240 denari

A soldo = 12 denari.

Accounts are kept in lire, soldi, and denari.

The usance of bills drawn from London is 3 months, from Amsterdam 2 months, and from France 1 month after date.

There are 5 days of grace; but bills may be protested the day after they are due.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London.....	rec.....19½ lire	for.....1 pound sterling.
Amsterdam.....	rec.....37 soldi	for.....1 florin banco.
Augsburg.....	rec.....42 soldi	for.....1 gulden current.
France.....	rec.....20 lire	for.....24 francs.
Geneva.....	rec.....82 soldi	for.....1 crown current.
Genoa.....	rec.....92 ½ lire	for.....1 zecchino.
Leghorn.....	rec.....86 soldi	for.....1 pezza of 8 reals.
Milan.....	rec.....92 soldi	for.....1 Philip.
Rome.....	rec.....87 soldi	for.....1 crown current.
Vienna.....	rec.....32 ½ soldi	for.....1 gulden.

TURIN ON LONDON.

Reduce 346 pounds 8 shillings 4 pence sterling into lire, soldi, and denari, at the exchange of 19 lire 15 soldi per pound sterling.

Equation. $346\ 8\ 4 = x$
 1 pound = 19 lire 15 soldi.

Rule.—Multiply 346 8 4 by 19 15, price of exchange.

$$\begin{array}{r}
 346\ 8\ 4 \\
 19\ 15 \\
 \hline
 3114 \\
 346 \\
 \text{for 10 soldi} \dots\dots\dots 173 \\
 \text{for 5 ditto} \dots\dots\dots 86\ 10 \\
 \text{for 8 shillings} \dots\dots\dots 7\ 18 \\
 \text{for 4 pence} \dots\dots\dots 6\ 7 \\
 \hline
 \end{array}$$

6841 14 7 result.

To prove this operation, divide 6841 14 7 by 19 15, price of exchange.

TURIN ON FRANCE.

Reduce 6826 francs into lire, soldi, and denari, at the exchange of $19\frac{1}{2}$ lire per 24 francs.

Equation. $6826 = x$
 24 francs = $19\frac{1}{2}$ lire.

Rule.—Multiply 6826 by $19\frac{1}{2}$, price of exchange, and divide the product by 24 francs.

$$\begin{array}{r}
 6826 \\
 19\frac{1}{2} \\
 \hline
 61434 \\
 6826 \\
 \text{for } \frac{1}{2} \dots\dots\dots 3413 \\
 \hline
 \end{array}$$

24)133107(5546 3 result.

To prove this operation, multiply 5546 3 by 24 francs, and divide the product by $19\frac{1}{2}$, price of exchange.

VENICE.

Monies of Exchange, and Regulations.

A lira piccoli = 20 soldi or 240 denari piccoli.

A soldo piccoli = 12 denari piccoli.

Accounts are kept in lire, soldi, and denari piccoli.

The value of usance for bills drawn from London is 3 months after date; from Amsterdam, Hamburg, France, and Spain, 2 months after date.

There are 6 days of grace, exclusive of Sundays and holidays.

Course of Exchange.

<i>Uncertain Prices.</i>		<i>Certain Prices.</i>
London	rec.....56 lire piccoli	for.....1 pound sterling.
Amsterdam	rec..... 4 lire 18 soldi	for.....1 florin banco.
Augsburg	rec..... 4 lire 17 soldi	for.....1 gulden.
Constantinople	rec..... 3 lire 6 soldi	for.....1 piastre.
France	rec..... 2 lire 5 soldi	for.....1 franc.
Genoa	rec.....38 soldi	for.....1 lira fuori di banco.
Hamburg	rec..... 4 lire 6 soldi	for.....1 marc lubs banco.
Leghorn	rec.....11 lire 18 soldi	for.....1 pezza of 8 reals.
Milan	rec.....34 soldi	for.....1 lira current.
Naples	rec..... 9 lire 18 soldi	for.....1 ducat di regno.
Portugal	giv.....66 reis	for.....1 lira piccoli.
Rome	rec.....12 lire 10 soldi	for.....1 crown current.
Vienna	rec..... 4 lire 8 soldi	for.....1 gulden.

VENICE ON LONDON.

Reduce 250 pounds 11 shillings 3 pence sterling into lire, soldi, and denari piccoli, at the exchange of 59 lire piccoli per pound sterling.

Equation.

$$250 \ 11 \ 3 = x$$

$$1 \text{ pound} = 59 \text{ lire.}$$

Rule.—Multiply 250 11 3 by 59, price of exchange.

$$\begin{array}{r}
 250 \ 11 \ 3 \\
 \times 59 \\
 \hline
 2250 \\
 1250 \\
 \hline
 \text{for 10 shillings} \dots\dots 29 \ 10 \\
 \text{for 1 ditto} \dots\dots\dots 2 \ 19 \\
 \text{for 3 pence} \dots\dots\dots 14 \ 9 \\
 \hline
 14783 \ 3 \ 9 \text{ result.}
 \end{array}$$

See the proof of this operation, page 31.

VENICE ON AMSTERDAM.

Reduce 2476 florins 12 stivers 8 penings banco into lire, soldi, and denari piccoli, at the exchange of 4 lire 18 soldi piccoli per florin banco.

Equation. $2476\ 12\ 8 = x$
 1 florin = 4 lire 18 soldi.

Rule.—Multiply 2476 12 8 by 4 18, price of exchange.

	2476	12	8	
	4	18		
	9904			
for 10 soldi.....	1238			
for 4 ditto.....	495	4		
for 4 ditto.....	495	4		
for 10 stivers.....	2	9		
for 2 do. 8 penings.		12	3	

12135 9 3 result.

To prove this operation, divide 12135 9 3 by 4 18, price of exchange.

VENICE ON FRANCE.

Reduce 3675 francs 50 cents into lire and soldi piccoli, at the exchange of 2 lire 4 soldi piccoli per franc.

Equation. $3675\ 50 = x$
 1 franc = 2 lire 4 soldi.

Rule.—Multiply 3675 50 by 2 4, price of exchange.

	3675	50	
	2	4	
	7350		
for 4 soldi.....	735		
for 50 cents.....	1	2	
	8086	2	result.

To prove this operation, divide 8086 2 by 2 4, price of exchange.

VENICE ON GENOA.

Reduce 958 lire 6 soldi 8 denari fuori di banco into lire, soldi, and denari piccoli, at the exchange of 38 soldi piccoli per lira fuori di banco.

Equation. $958\ 6\ 8 = x$

1 lira = 38 soldi

20 soldi = 1 lira.

Rule.—Multiply 958 6 8 by 38, price of exchange, and divide the product by 20 soldi.

	958	6	8
	38		
	7664		
	2874		
for 5 soldi.....	9	10	
for 1 soldo	1	18	
for 8 denari.....	1	5	4
	20	36416	13 4

1820 16 8 result.

See the proof of this operation, page 69.

VENICE ON HAMBURG.

Reduce 5486 marcs 12 shillings lubs banco into lire, soldi, and denari piccoli, at the exchange of 4 lire 6 soldi piccoli per marc lubs banco.

Equation. $5486\ 12 = x$

1 marc = 4 lire 6 soldi.

Rule.—Multiply 5486 12 by 4 6, price of exchange.

	5486	12
	4	6
	21944	
for 4 soldi	1097	4
for 2 ditto	548	12
for 8 shillings	2	3
for 4 ditto	1	1 6

23593 0 6 result.

To prove this operation, divide 23593 0 6 by 4 6, price of exchange.

VENICE ON LEGHORN.

Reduce 196 pezze 17 soldi 6 denari of 8 reals into lire, soldi, and denari piccoli, at the exchange of 11 lire 18 soldi piccoli per pezza of 8 reals.

Equation. $196\ 17\ 6 = x$
1 pezza = 11 lire 18 soldi.

Rule.—Multiply 196 17 6 by 11 18, price of exchange.

	196 17 6
	11 18
	—
	196
	196
for 10 soldi.....	98
for 8 ditto.....	78 8
for 10 soldi.....	5 19
for 5 ditto.....	2 19 6
for 2 ditto 6 denari.	1 9 9

2342 16 3 result.

See the proof of this operation, page 81.

VENICE ON NAPLES.

Reduce 585 ducats 75 grains into lire, soldi, and denari piccoli, at the exchange of 9 lire 16 soldi piccoli per ducat di regno.

Equation. $585\ 75 = x$
1 ducat = 9 lire 16 soldi.

Rule.—Multiply 585 75 by 9 16, price of exchange.

	585 75
	9 16
	—
	5265
for 10 soldi.....	292 10
for 5 ditto.....	146 5
for 1 soldo	29 5
for 50 grains	4 18
for 25 ditto.....	2 9

5740 7 result.

To prove this operation, divide 5740 7 by 9 16, price of exchange.

VIENNA AND PRAGUE.

Monies of Exchange, and Regulations.

A rixdollar = $1\frac{1}{2}$ gulden or 90 cruitzers.

A gulden = 60 cruitzers or 240 fenings.

Accounts are kept in guldens and cruitzers.

The value of usance is 14 days after acceptance.

There are 3 days of grace, which are not allowed for bills at sight.

Course of Exchange.

	<i>Uncertain Prices.</i>	<i>Certain Prices.</i>
London	rec.....12 gulden 30 cruitzers...	for.....1 pound sterling.
Amsterdam	rec.....186 rixdollars.....	for.....100 rixdollars banco.
Idem	giv..... $25\frac{1}{2}$ stivers banco.....	for.....1 rixdollar.
Augsburg	rec.....130 gulden	for.....100 gulden current.
Constantinople	rec.....73 gulden	for.....100 piastres.
France	rec.....31 cruitzers	for.....1 franc.
Genoa	giv.....47 soldi fuori di banco...	for.....1 gulden.
Hamburg	rec.....199 gulden	for.....200 marcs lubs banco.
Leghorn	giv.....43 soldi moneta buona...	for.....1 gulden.
Naples	rec.....128 cruitzers.....	for.....1 ducat di regno.
Spain	rec.....258 gulden	for.....100 ducats of exchange.
Venice	giv.....4 lire 5 soldi.....	for.....1 gulden.

VIENNA ON LONDON.

Reduce 313 pounds 8 shillings sterling into gulden and cruitzers, at the exchange of 12 gulden 40 cruitzers per pound sterling.

Equation.

$$313\ 8 = x$$

1 pound = 12 gulden 40 cruitzers.

Rule.—Multiply 313 8 by 12 40, price of exchange.

	313	8
	—	12 40
	626	
	313	
for 20 cruitzers.....	104	20
for 20 ditto.....	104	20
for 4 shillings.....	2	32
for 4 ditto.....	2	32

3969 44 result.

To prove this operation, divide 3969 44 by 12 40, price of exchange.

VIENNA ON AMSTERDAM.

Reduce 666 florins 16 stivers 8 penings banco into guldens and cruitzers, at the exchange of $25\frac{1}{2}$ stivers banco per rixdollar.

Equation.

$$\begin{aligned} 666\ 16\ 8 &= x \\ 1\ \text{florin} &= 20\ \text{stivers} \\ 25\frac{1}{2}\ \text{stivers} &= 1\ \text{rixdollar} \\ 1\ \text{rixdollar} &= 1\frac{1}{2}\ \text{gulden.} \end{aligned}$$

Rule.—Multiply 666 16 8 by 30, fixed number, and divide the product by $25\frac{1}{2}$, price of exchange.

$25\frac{1}{2}$	666 16 8	51)	40009 $\frac{1}{2}$	(784 30 result.
2 fraction	30		430	
			229	
51 div.	19980		25	
for 10 stivers.....	15		60	
for 5 ditto.....	7 $\frac{1}{2}$		—	
for 1 ditto.....	1 $\frac{1}{2}$		1530	
for 8 penings....	$\frac{3}{4}$		00	
	20004 $\frac{3}{4}$			
	2 fraction			
	40009 $\frac{1}{2}$			

See the proof of this operation, page 37.

VIENNA ON FRANCE.

Reduce 886 francs into guldens and cruitzers, at the exchange of 32 cruitzers per franc.

Equation.

$$\begin{aligned} 886 &= x \\ 1\ \text{franc} &= 32\ \text{cruitzers} \\ 60\ \text{cruitzers} &= 1\ \text{gulden.} \end{aligned}$$

Rule.—Multiply 886 by 32, price of exchange, and divide the product by 60 cruitzers.

$$\begin{array}{r} 886 \\ 32 \\ \hline 1772 \\ 2658 \end{array}$$

60)28352(472 32 result.

To prove this operation, multiply 472 32 by 60 cruitzers, and divide the product by 32, price of exchange.

VIENNA ON HAMBURG.

Reduce 870 marcs 13 shillings 4 fenings lubs banco into guldens and cruitzers, at the exchange of 204 guldens for 200 marcs lubs banco.

Equation. $870\ 13\ 4 = x$
 $200\ \text{marcs} = 204\ \text{guldens.}$

Rule.—Multiply 870 13 4 by 204, price of exchange, and divide the product by 200 marcs.

870 13 4	200)	177650	(888 15 result
204		1765	
		1650	
3480		50	
17400		60	
for 8 shillings..... 102			
for 4 ditto..... 51		3000	
for 1 ditto..... 12 $\frac{3}{4}$		1000	
for 4 fenings..... 4 $\frac{1}{4}$		0	
		177650	

See the proof of this operation, page 75.

VIENNA ON LEGHORN.

Reduce 542 pezze 16 soldi of 8 reals into guldens and cruitzers, at the exchange of 43 soldi moneta buona per gulden.

Equation. $542\ 16 = x$
 $1\ \text{pezza} = 115\ \text{soldi}$
 $43\ \text{soldi} = 1\ \text{gulden.}$

Rule.—Multiply 542 16 by 115 soldi, and divide the product by 43, price of exchange.

542 16	43)	62422	(1451 40 result
115		194	
		222	
2710		72	
542		29	
542		60	
for 10 soldi..... 57 30			
for 5 ditto..... 28 45		1740	
for 1 ditto..... 5 45		20	
		62422	

To prove this operation, multiply 1451 40 by 43, price of exchange, and divide the product by 115 soldi.

VIENNA ON NAPLES.

Reduce 156 ducats 75 grains into guldens and cruitzers, at the exchange of 128 cruitzers per ducat di regno.

Equation. $156\ 75 = x$

1 ducat = 128 cruitzers

60 cruitzers = 1 gulden.

Rule.—Multiply 156 75 by 128, price of exchange, and divide the product by 60 cruitzers.

$$\begin{array}{r} 156\ 75 \\ \times 128 \\ \hline 1248 \\ 312 \\ \hline 156 \end{array}$$

for 50 grains..... 64

for 25 ditto..... 32

60)20064(334 24 result.

206

264

24

To prove this operation, multiply 334 24 by 60 cruitzers, and divide the product by 128, price of exchange.

THE UNITED STATES OF AMERICA.

Monies of Exchange, and Regulations.

A dollar = 100 cents.

Accounts are kept in dollars and cents.

Each dollar is rated at 4 shillings 6 pence sterling at par; therefore

40 dollars = 9 pounds sterling.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

Amsterdam.....rec.....37 cents.....for.....1 florin current.

Hamburg.....rec.....33½ cents.....for.....1 marc lubs banco.

N. B. America exchanges with London at par, or at so much per cent either above or under par. When the exchange is not at par, they reduce the sterling into dollars, and add or deduct, according to the circumstance, the *agio*, that is, the difference between the par of exchange and the actual course.

THE UNITED STATES OF AMERICA.

Currencies, and their Par in Sterling.

A pound currency = 20 shillings or 240 pence.

In Georgia and South Carolina, a dollar is worth 4 shillings 6 pence currency ; therefore

100 pounds currency = 100 pounds sterling.

In New England and Virginia, a dollar is worth 6 shillings currency ; therefore

133 $\frac{1}{3}$ pounds currency = 100 pounds sterling.

To reduce this currency into sterling, multiply by 3, and divide by 4.

In Delaware, Maryland, New Jersey, and Pennsylvania, a dollar is worth 7 shillings 6 pence currency ; therefore

166 $\frac{2}{3}$ pounds currency = 100 pounds sterling.

To reduce this currency into sterling, multiply by 3, and divide by 5.

In New York and North Carolina, a dollar is worth 8 shillings currency ; therefore

177 $\frac{7}{9}$ pounds currency = 100 pounds sterling.

To reduce this currency into sterling, multiply by 9, and divide by 16.

N. B. The several Provincial Currencies abovementioned are abolished in the United States of America, and not any accounts kept in those monies are admitted in the courts of justice : they are still used, however, by the force of habit, in certain commercial transactions.

 AMERICA ON LONDON.

Reduce 173 pounds 17 shillings 6 pence sterling into dollars and cents at par.

Equation. 173 17 6 = x

9 pounds = 40 dollars.

Rule.—Multiply 173 17 6 by 40 dollars, and divide the product by 9 pounds.

	173 17 6	9)6955(772 77 $\frac{7}{9}$ result
	40	65
		25
	6920	7
for 10 shillings.....	20	100
for 5 ditto.....	10	
for 2 do. 6 pence.....	5	700
		70
	6955	7

To prove this operation, multiply 772 77 $\frac{7}{9}$ by 9, and divide the product by 40.

AMERICA ON AMSTERDAM.

Reduce 839 florins 15 stivers current into dollars and cents, at the exchange of 37 cents per florin current.

Equation. $839\ 15 = x$

1 florin = 37 cents

100 cents = 1 dollar.

Rule.—Multiply 839 15 by 37, price of exchange, and divide the product by 100 cents.

	839 15
	37
	5873
	2517
for 10 stivers.....	18½
for 5 ditto	9¼

1,00)310,70¾(310 70¾ result.

To prove this operation, multiply 310 70¾ by 100 cents, and divide the product by 37, price of exchange.

AMERICA ON HAMBURG.

Reduce 1236 marcs 12 shillings lubs banco into dollars and cents, at the exchange of 33½ cents per marc lubs banco.

Equation. $1236\ 12 = x$

1 marc = 33½ cents

100 cents = 1 dollar.

Rule.—Multiply 1236 12 by 33½, price of exchange, and divide the product by 100 cents.

	1236 12
	33½
	3708
	3708
for ½.....	618
for 8 shillings.....	16¾
for 4 ditto	8¾

1,00)414,311⅛(414 311⅛ result.

To prove this operation, multiply 414 311⅛ by 100 cents, and divide the product by 33½, price of exchange.

EAST INDIES.

Monies of Exchange.

BOMBAY.

A rupee..... = 4 quarters or 400 reis.

A quarter = 100 reis.

CALCUTTA.

A rupee..... = 16 annas or 192 pices.

An anna..... = 12 pices.

100 sicca rupees . = 116 current rupees.

MADRAS.

A pagoda = 36 fanams or 288 pices.

A fanam..... = 8 pices.

*Course of Exchange.**Uncertain Prices.**Certain Prices.*

Bombay	-----rec-----	2 shillings 6 pence	-----for-----	1 rupee.
Calcutta	-----rec-----	2 shillings 8 pence	-----for-----	1 sicca rupee.
Madras	-----rec-----	8 shillings 9 pence	-----for-----	1 star pagoda.

Table of Exchange, ordered to be adopted for the Adjustment of the Calcutta Customs.

Countries.	Coins.	Rates of Exchange.
Great Britain	Pound sterling	at 10 sicca rupees.
Germany	Crown	at 2 sicca rupees.
Denmark	Rixdollar	at 1 sicca rupee 10 annas.
Ceylon	Rixdollar	at 14 annas.
France	Livre tournois	at 24 for 10 sicca rupees.
Ditto	Mauritius livre	at 48 for 10 sicca rupees.
Spain	Spanish dollar	at $2\frac{1}{4}$ sicca rupees.
Portugal and Madeira	Mill-rea	at 2 sicca rupees.
Bussorah	Raize piastre	at 12 annas.
China	Tale	at $3\frac{1}{4}$ sicca rupees.
Madras	Star pagoda	at $3\frac{1}{4}$ sicca rupees.
Ditto	Sawmy do.	at 4 sicca rupees.

AMERICAN CURRENCY to be converted into Pounds Sterling as follows :

New England.....By multiplying by 3 and dividing by 4

Virginia do. do.

New YorkBy multiplying by 9 and dividing by 16

Pennsylvania do. by 3 do. by 5

South CarolinaBy deducting $\frac{1}{27}$ th part.

Georgia do.

The pound sterling to be rated as above, at 10 sicca rupees.

Where the invoices are in dollars, the dollar to be rated at $2\frac{1}{4}$ sicca rupees.

WEST INDIES ON LONDON.

Monies of Exchange.

A pound currency = 20 shillings or 240 pence.

Accounts are kept in pounds, shillings, and pence currency.

140 pounds currency = 100 pounds sterling.

=

Reduce 573 pounds 12 shillings 6 pence sterling into pounds, shillings, and pence currency, at the exchange of 140 pounds currency for 100 pounds sterling.

Equation. $573\ 12\ 6 = x$

100 pounds sterling = 140 pounds currency.

Rule.—Multiply 573 12 6 by 140, price of exchange, and divide the product by 100 pounds.

$$\begin{array}{r}
 573\ 12\ 6 \\
 140 \\
 \hline
 22920 \\
 573 \\
 \hline
 \text{for 10 shillings} \dots 70 \\
 \text{for 2 do. 6 pence} \dots 17\ 10 \\
 \hline
 1,00)803,07\ 10(803\ 1\ 6\ \text{result} \\
 20 \\
 \hline
 1,50 \\
 12 \\
 \hline
 6,00
 \end{array}$$

To prove this operation, multiply 803 1 6 by 100 pounds, and divide the product by 140, price of exchange.

Arbitrations of Exchange

BETWEEN LONDON

AND THE

PRINCIPAL PLACES OF EUROPE.

~~~~~

**A**FTER having treated generally of the division of monies, and given rules for the calculation of operations in exchange, it appears to me opportune to advert to the principles from which is deduced the mode of discovering the advantages resulting from the combinations of several quotations of exchange: such advantages originate in the variations to which exchanges are subject, either by political, financial, or commercial operations, which have naturally a contemporaneous influence on the balance of trade. In order to discover contingencies so very interesting, arbitrations of exchange, which are the object of this part of my work, are used.

In the following heads, I shall successively lay down the principles upon which merchants speculate in exchanges; the manner of executing banking orders arising from their speculations; and, lastly, the circulations adroitly created in this branch of business, for the purpose of retarding effective payments, or of carrying on speculations by artificial funds. Whether this subject be considered under a political or a commercial point of view, the advantages and importance of the operations in question will be obvious by the developement of the plan of the great circulation effected by exchanges upon occasion of the subsidy paid by Spain to France, when the former not only derived a remarkable facility in the payment, but was even enabled to substitute artificial payments, till the arrival of the treasures which she expected from her colonies.

Arbitrations of exchange are calculations which merchants make, to find, by the combinations resulting from several quotations of exchange, the proportional exchange between two places through any intermediate place, whence is ascertained the place which offers the most advantage either to remit or to draw; that is, whether it will answer, in the instance of a remittance, to pur-



chase, upon the spot, a bill upon an intermediate place, to be sent for negotiation to that place which is the ultimate object of the operation ; or, in the instance of a draft, whether it will answer that a remittance should be made from such place to an intermediate place, upon which the amount might then be valued.

If the place where a merchant resides gives the certain price to that with which he arbitrates, he should, in remitting, make use of that intermediate place by which the highest exchange may be obtained ; and the contrary in drawing. But, if the place where one is gives the uncertain price, it is eligible to remit by that place which establishes the lowest exchange, and *vice versâ* in drawing.

Arbitrations are calculated either by the rule of conjunction, or by the rule of equation.

## PROPOSITION.

Let it be supposed that a bill on Hamburg, taken in London at 34 shillings and 6 grotes Flemish banco per pound sterling, be remitted to Lisbon, and negotiated at 44 grotes Flemish banco per crusade of 400 reis ; what is the proportional exchange between London and Lisbon resulting from such negotiation ? or, in other words, how many pence sterling are disbursed to obtain 1000 reis ?

It is evident that Lisbon is the place with which London arbitrates, and that Hamburg is the medium of the arbitration. The exchange of London upon Hamburg is known by the quotation at London, as is the exchange of Lisbon upon Hamburg by the quotation received from Lisbon : it remains, therefore, to be ascertained, by the combination of those two exchanges, whether the indirect course between London and Lisbon, resulting from such operation, be more advantageous than the direct, either to remit or to draw.

*Operation, by the Rule of Conjunction.*

## STATEMENT.

| Antecedents.                       | Consequents.         | Certain price. | Proport. exch.            |
|------------------------------------|----------------------|----------------|---------------------------|
| 400 reis                           | : 1 crusade          | :: 1000 reis   | : 63 $\frac{5}{8}$ pence. |
| 1 crusade                          | : 44 grotes          |                |                           |
| 12 grotes                          | : 1 shilling Flemish |                |                           |
| 34 $\frac{1}{2}$ shillings Flemish | : 1 pound sterling   |                |                           |
| 1 pound sterling                   | : 240 pence sterling |                |                           |

In similar statements, the certain price of exchange is constantly the third term, and the quotient or fourth term is the uncertain price or proportional exchange resulting from the operation. The first term of the antecedents is of the same nature as the certain



price, and the last term of the consequents is of the same denomination as the uncertain price, while the product of the extremes is equal to the product of the means. If, then, we insert the third term, or certain price, as the first of the consequents, and the fourth term, or uncertain price, as the first of the antecedents, both columns will be composed of quantities differently expressed, yet equal, which, when multiplied into each other, will give equivalent products, thus :

|                                    |                    |
|------------------------------------|--------------------|
| 63 $\frac{5}{8}$ pence             | 1000 reis          |
| 400 reis                           | 1 crusade          |
| 1 crusade                          | 44 grotes          |
| 12 grotes                          | 1 shilling Flemish |
| 34 $\frac{1}{2}$ shillings Flemish | 1 pound sterling   |
| 1 pound sterling                   | 240 pence sterling |

$$\begin{array}{r} 10560000 \\ \hline \end{array} = \begin{array}{r} 10560000 \\ \hline \end{array}$$

Hence it is evident that we may substitute to the preceding proportions their corresponding equations, by which means the operation is simplified as follows :

*Operation by the Rule of Equation.*

We have seen that the certain price of exchange is constantly the third term of the proportion, which, in the corresponding equation, becomes the first term of the dividend; therefore, in order to resolve the preceding proposition, I begin the formation of the column of the dividend by the certain price of exchange between London and Lisbon, that is, by 1000 reis, and place on the right its equivalent represented by  $x$ , in the following manner,

$$1000 \text{ reis} = x.$$

Then I observe that the first term of the antecedents, or the first term of the divisor, must always be of the same kind as the third term of the proportion, that is, as the first term in the dividend of the equation : thus, as Lisbon exchanges with Hamburg by a crusade of 400 reis, I reduce the reis into crusades, by setting down 400 reis as the first term of the divisor, placing opposite its equivalent, that is, 1 crusade, in the following manner :

$$\begin{array}{r} 1000 \text{ reis} = x \\ 400 \text{ reis} = 1 \text{ crusade.} \end{array}$$

I proceed, and perceiving, by the quotation received from Lisbon, that 44 grotes Flemish banco are equivalent with 1 crusade, I reduce the crusades into grotes, by placing 1 crusade as the second term of the divisor, and 44 grotes as the third term of the dividend, as follows :



$$\begin{aligned}
 &1000 \text{ reis} = x \\
 400 \text{ reis} &= 1 \text{ crusade} \\
 1 \text{ crusade} &= 44 \text{ grotes.}
 \end{aligned}$$

Now, as Hamburg exchanges with London by shillings Flemish banco, I reduce 44 grotes into shillings, by setting down 12 grotes as the third term of the divisor, and placing opposite its equivalent, or 1 shilling, in the following manner:

$$\begin{aligned}
 &1000 \text{ reis} = x \\
 400 \text{ reis} &= 1 \text{ crusade} \\
 1 \text{ crusade} &= 44 \text{ grotes} \\
 12 \text{ grotes} &= 1 \text{ shilling Flemish.}
 \end{aligned}$$

I proceed, and as the quotation at London denotes that 34 shillings 6 grotes Flemish banco are equivalent with 1 pound sterling, I reduce the shillings Flemish into pounds sterling, by placing them respectively in the divisor and dividend as follows:

$$\begin{aligned}
 &1000 \text{ reis} = x \\
 400 \text{ reis} &= 1 \text{ crusade} \\
 1 \text{ crusade} &= 44 \text{ grotes} \\
 12 \text{ grotes} &= 1 \text{ shilling Flemish} \\
 34\frac{1}{2} \text{ shillings Flemish} &= 1 \text{ pound sterling.}
 \end{aligned}$$

And, lastly, as London exchanges with Lisbon by pence sterling, and as the last term of the dividend must be of the same denomination as the result of the operation, I reduce 1 pound sterling into pence, by placing 240 pence in opposition to 1 pound, and I obtain the following

#### *Equation.*

| Divisor.                          |   | Dividend.               |
|-----------------------------------|---|-------------------------|
|                                   |   | $1000 \text{ reis} = x$ |
| 400 reis                          | = | 1 crusade               |
| 1 crusade                         | = | 44 grotes               |
| 12 grotes                         | = | 1 shilling Flemish      |
| $34\frac{1}{2}$ shillings Flemish | = | 1 pound sterling        |
| 1 pound sterling                  | = | 240 pence sterling.     |

Whence the following general rule.

#### *To find the Equation.*

Always place the certain price of exchange as the first term of the dividend, the last term of which must be of the same nature as the uncertain price. Let each term of the divisor be of the same denomination as that of the dividend immediately preceding, and place in the opposite column the quantities which are in equation with the terms of the divisor.

#### *Application to the preceding Proposition.*

1000 reis, which stand as the first term of the dividend, are the



certain price of the exchange between London and Lisbon ; and 240 pence, or the last term of the dividend, are of the same nature as the uncertain price.

400 reis, 1 crusade, 12 grotes,  $34\frac{1}{2}$  shillings Flemish, and 1 pound sterling, or the terms of the divisor, are each of the same denomination as each of the terms of the dividend immediately preceding ; and 1 crusade, 44 grotes, 1 shilling Flemish, 1 pound sterling, and 240 pence, or the remaining terms of the dividend, are respectively opposed as equivalent quantities.

*To resolve the Equation.*—Multiply all the terms of each column into each other respectively ; divide the product of the terms of the dividend by the product of the terms of the divisor, and the quotient will be the answer required.

Calculations of arbitrations are, however, considerably abridged upon the undermentioned principle.

It is known, that all numbers of the same value, when opposed, neutralize each other. Hence it is, that we may efface from each column all terms which are alike, or divide them by one same number, and substitute their quotients, as such reduction does not alter the result of the operation.

*Application of this Principle to the preceding Equation.*

$$\begin{array}{rcl}
 & 1000 & = x \\
 x \ 400 & = & x \\
 & x & = 44 \\
 x \ 12 & = & x \\
 & 34\frac{1}{2} & = x \\
 x & = & 140 \ 60 \ 5
 \end{array}$$

To abridge the calculation of this equation, I begin by striking out two ciphers in each column, which answers to dividing 400 and 1000 by 100, and reduces those numbers to 4 and 10 ; next I divide 4 and 240 by 4, which gives the quotients 1 and 60 ; then I divide 12 and 60 by 12, which gives the quotients 1 and 5 ; and, finally, by striking out the units, which are numbers without powers, the divisor is reduced to  $34\frac{1}{2}$ , and the dividend to  $44 \times 10 \times 5$ , or to  $44 \times 50$ .

It will occur to the reader, that, in every arbitration between London and Lisbon, through Hamburg, there are some terms not subject to any variation ; such are, 1000 reis, as the certain price of exchange between London and Lisbon ; 400 reis, 12 grotes, and 240 pence, as the component parts of one crusade, one



shilling Flemish, and of one pound sterling. Hence 50, product of 10 by 5, which is also the quotient of the same invariable numbers  $\frac{1000 \times 240}{400 \times 12}$ , may be defined a *fixed number*, and substituted to the four effective and invariable numbers, by which means the equation will be reduced to the following :

$$50 = x$$

$$34\frac{1}{2} = 44.$$

It is evident, therefore, first, that, to solve the proposition in question, it is only requisite to multiply 50 by 44, dividing the product by  $34\frac{1}{2}$ . Secondly, that, in every arbitration between London and Lisbon through Hamburg, it is only necessary to multiply the fixed number 50 by the actual course of exchange between Lisbon and Hamburg, and to divide the product by the actual course of London on Hamburg.

I presume that what I have said will be sufficient to demonstrate the principle and utility of the rules which I have given for each operation ; and, as I have inserted the respective fixed numbers, the arbitrations may be calculated without the trouble of stating the operations in their original terms, since the two uncertain prices of exchange are in each operation the only terms subject to variation.

In every arbitration between two places by means of a third, there is necessarily a combination of two courses of exchange, which are often themselves fractional numbers. When one of those courses, or both, are in the dividend, the multiplication of its terms into each other must include the fractions by proportionate parts of their units ; and if the product of the dividend should be a whole number and a fraction, such fraction should merely be added to the product of the remainder multiplied by the parts of the units.

When one of the same courses, or both, are in the divisor, it is in like manner necessary that the multiplication of its terms into each other should include the fractions by proportionate parts of their units ; but when the divisor itself is a whole number and a fraction, it is then, and in such case only, necessary to remove the denominator of such fraction, that is, to multiply the divisor and the dividend by the denominator of the fraction, adding its numerator to the amount of the divisor.



In order, therefore, to resolve the equation,

$$50 = x$$

$$34\frac{1}{2} = 44,$$

the following method must be observed :

|                 |                                    |  |
|-----------------|------------------------------------|--|
| $34\frac{1}{2}$ | 50                                 |  |
| 2 fraction      | 44                                 |  |
| —               | —                                  |  |
| 69 divisor      | 2200                               |  |
|                 | 2 fraction                         |  |
|                 | —                                  |  |
|                 | 69)4400(63 $\frac{53}{89}$ result. |  |
|                 | 260                                |  |
|                 | 53                                 |  |

Thus the value of  $x$  being found, we have consequently the following equation,

$$50 = 63\frac{53}{89}$$

$$34\frac{1}{2} = 44 ;$$

which demonstrates that the proportional exchange between London and Lisbon, resulting from the solution of the proposition, is  $63\frac{53}{89}$  pence sterling for 1000 reis.

In respect to the manner of placing in the equation the charges which are incurred for commissions, brokerages, and postages, upon an indirect draft or remittance, I refer my readers to the observations preceding the exemplification of arbitrations, and to the general rule I have given for charges ; observing, however, that the charges are generally added to, or deducted from, the result.

#### *Proof of the Rule of Equation.*

To prove this rule, insert, as the first term of the divisor, the result of the operation, and multiply the terms of each column into each other respectively ; their products must be equal.

The same rule is also proved by an inverse operation ; that is, by placing, as the first term of the dividend, the uncertain price resulting from the arbitration, when the certain price will be the quotient.

#### EXAMPLE.

$$63\frac{53}{89} \text{ pence sterling} = 1000 \text{ reis result}$$

$$240 \text{ pence sterling} = 1 \text{ pound sterling}$$

$$1 \text{ pound sterling} = 34\frac{1}{2} \text{ shillings Flemish}$$

$$1 \text{ shill. Flemish} = 12 \text{ grotes}$$

$$44 \text{ grotes} = 1 \text{ crusade}$$

$$1 \text{ crusade} = 400 \text{ reis.}$$

I shall conclude by an example which will prove that all arbi-



trations of exchange are upon the same principle, since they have only for object to find the proportional exchange between two places resulting from the combination of two or several quotations of exchange. And as the number of places, or quantities employed, do not alter their nature, the distinction between simple and compound arbitrations, which is made by writers upon exchanges, may be omitted.

## EXAMPLE.

London, having funds at Hamburg, draws the amount upon Lisbon, and, in order to provide for the draft, directs Hamburg to remit to Paris, Paris to remit to Madrid, and Madrid to remit to Lisbon.

Hamburg remits to Paris at the exchange of 25 shillings lubs banco for 3 francs ; Paris remits to Madrid at 15 livres tournois for 1 pistole of exchange ; Madrid remits to Lisbon at 2300 reis for 1 pistole of exchange ; and London draws upon Lisbon at 63 pence sterling per milreis. The charges incurred by these several remittances (exclusive of interest) are supposed to amount to 3 per cent, that is,  $\frac{3}{4}$  per cent at each place for commission, brokerage, and postages. The question, therefore, is, what proportional exchange will those prices establish between London and Hamburg, inclusive of the charges ?

*Equation.*

|                      |                                                       |
|----------------------|-------------------------------------------------------|
|                      | 1 pound sterling = 35 shillings 1 $\frac{1}{4}$ grote |
| 1 pound sterling =   | 240 pence sterling                                    |
| 63 pence sterling =  | 1000 reis                                             |
| 2300 reis =          | 1 pistole of exchange                                 |
| 1 pistole of exch. = | 15 livres tournois                                    |
| 81 livres tourn. =   | 80 francs                                             |
| 3 francs =           | 25 shillings banco                                    |
| 6 shillings banco =  | 1 shilling Flemish                                    |
| 100 with charges =   | 103.                                                  |

Such arbitrations, however, through several places, as stated in books, are generally imaginary, and very seldom practicable in London, by the irregularity attending communications with the continent ; the fluctuations to which exchanges are subject in the interval between the transmission of the orders and their execution ; and, lastly, the charges of commission, brokerage, and postages, which would be incurred at every place.



## LONDON AND AMSTERDAM.

*Proportional Exchange.*

|                   | Quotation at London. | Quotation from Amsterdam. |
|-------------------|----------------------|---------------------------|
| On Amsterdam..... | 37 3                 |                           |
| Genoa .....       | 45                   | 83½                       |
| Hamburg.....      | 35                   | 34                        |
| Leghorn.....      | 48½                  | 90                        |
| Lisbon.....       | 62                   | 44½                       |
| Madrid .....      | 34½                  | 88½                       |
| Paris .....       | 25 15                | 53½                       |

*Observation.*—London gives the certain price to Amsterdam ; that is, one pound sterling for so many shillings Flemish banco, more or less ; therefore, when London remits to Amsterdam, that place through which the highest course of exchange can be obtained is to be preferred, because more shillings Flemish will be received in exchange for one pound sterling. On the contrary, when London has to draw upon Amsterdam, that place should be chosen which furnishes the lowest course, because less shillings Flemish will be given in exchange for a pound sterling.

If you include the charges in the calculation, insert, for an indirect remittance, 100 in the divisor, and 100 less the charges in the dividend ; and, for an indirect draft, place 100 in the divisor, and 100 more the charges in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND AMSTERDAM

*Through GENOA.*

A bill on Genoa taken in London at 45 pence sterling per pezza of  $5\frac{3}{4}$  lire fuori di banco is remitted to Amsterdam, and negotiated at  $83\frac{1}{2}$  grotes Flemish banco per pezza fuori di banco : what is the proportional exchange between London and Amsterdam ?

*Equation.*

$$\begin{array}{lcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence} \\
 45 \text{ pence} & = & 1 \text{ pezza} \\
 1 \text{ pezza} & = & 83\frac{1}{2} \text{ grotes} \\
 12 \text{ grotes} & = & 1 \text{ shilling Flemish.}
 \end{array}$$

*Rule.*—Multiply 20, fixed number, by the course of exchange between Amsterdam and Genoa ; and divide the product by the course of London on Genoa.

$$\begin{array}{r}
 20 \quad 45)1670(37 \ 1\frac{1}{2} \text{ result} \\
 \underline{83\frac{1}{2}} \quad 320 \\
 1660 \quad 5 \\
 \underline{10} \quad 12 \\
 1670 \quad 60 \\
 \quad 15
 \end{array}$$

## LONDON AND AMSTERDAM

*Through HAMBURG.*

A bill on Hamburg taken in London at 35 shillings Flemish banco per pound sterling is remitted to Amsterdam, and negotiated at 34 stivers banco for 2 marcs lub $\text{ }^{\text{s}}$  banco : what is the proportional exchange between London and Amsterdam ?

*Equation.*

$$\begin{array}{lcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 35 \text{ shillings Flemish} \\
 8 \text{ shillings Flemish} & = & 3 \text{ marcs} \\
 2 \text{ marcs banco} & = & 34 \text{ stivers banco} \\
 6 \text{ stivers} & = & 1 \text{ shilling Flemish.}
 \end{array}$$

*Rule.*—Multiply the course of exchange between London and Hamburg by the course of Amsterdam on Hamburg, and divide the product by 32, fixed number.

$$\begin{array}{r}
 35 \quad 32)1190(37 \ 2\frac{1}{4} \text{ result} \\
 \underline{34} \quad 230 \\
 140 \quad 6 \\
 \underline{105} \quad 12 \\
 1190 \quad 72 \\
 \quad 8
 \end{array}$$



## LONDON AND AMSTERDAM

*Through* LEGHORN.

A bill on Leghorn taken in London at  $48\frac{1}{2}$  pence sterling per pezza of 8 reals is remitted to Amsterdam, and negotiated at 90 grotes Flemish banco per pezza of 8 reals: what is the proportional exchange between London and Amsterdam?

*Equation.*

$$\begin{array}{lcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence} \\
 48\frac{1}{2} \text{ pence} & = & 1 \text{ pezza} \\
 1 \text{ pezza} & = & 90 \text{ grotes} \\
 12 \text{ grotes} & = & 1 \text{ shilling Flemish.}
 \end{array}$$

*Rule.*—Multiply 20, fixed number, by the course of exchange between Amsterdam and Leghorn; and divide the product by the course of London on Leghorn.

|                 |            |                                   |
|-----------------|------------|-----------------------------------|
| $48\frac{1}{2}$ | 20         | 97)3600(37 $1\frac{1}{3}$ result. |
| 2 fraction      | 90         | 690                               |
| 97 div.         | 1800       | 11                                |
|                 | 2 fraction | 12                                |
|                 | 3600       | 132                               |
|                 |            | 35                                |

## LONDON AND AMSTERDAM

*Through* LISBON.

A bill on Lisbon taken in London at 62 pence sterling per milreis is remitted to Amsterdam, and negotiated at  $44\frac{1}{2}$  grotes Flemish banco per crusade of 400 reis: what is the proportional exchange between London and Amsterdam?

*Equation.*

$$\begin{array}{lcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence} \\
 62 \text{ pence} & = & 1000 \text{ reis} \\
 400 \text{ reis} & = & 44\frac{1}{2} \text{ grotes} \\
 12 \text{ grotes} & = & 1 \text{ shilling Flemish.}
 \end{array}$$

*Rule.*—Multiply 50, fixed number, by the course of exchange between Amsterdam and Lisbon; and divide the product by the course of London on Lisbon.

|                 |                                   |
|-----------------|-----------------------------------|
| 50              | 62)2225(35 $10\frac{2}{3}$ result |
| $44\frac{1}{2}$ | 365                               |
| 2200            | 55                                |
| 25              | 12                                |
| 2225            | 110                               |
|                 | 55                                |
|                 | 660                               |
|                 | 40                                |



## LONDON AND AMSTERDAM

*Through MADRID.*

A bill on Madrid taken in London at  $34\frac{1}{2}$  pence sterling per dollar of exchange is remitted to Amsterdam, and negotiated at  $88\frac{1}{4}$  grotes Flemish banco per ducat of exchange: what is the proportional exchange between London and Amsterdam?

*Equation.*

|                         |                        |
|-------------------------|------------------------|
|                         | 1 pound sterling = $x$ |
| 1 pound sterling =      | 240 pence              |
| $34\frac{1}{2}$ pence = | 1 dollar               |
| 375 dollars =           | 272 ducats             |
| 1 ducat =               | $88\frac{1}{4}$ grotes |
| 12 grotes =             | 1 shilling Flemish.    |

*Rule.*—Multiply 1088, fixed number, by the course of exchange between Amsterdam and Madrid; and divide the product by 75, fixed number, multiplied by the course of London on Madrid,

|                    |                 |                                      |
|--------------------|-----------------|--------------------------------------|
| 75                 | 1088            | 5175)192032(37 $1\frac{5}{6}$ result |
| $84\frac{1}{2}$    | $88\frac{1}{4}$ | 36782                                |
| 300                | 8704            | 557                                  |
| 225                | 8704            | 12                                   |
| $37\frac{1}{2}$    | 272             | 1114                                 |
| 2587 $\frac{1}{2}$ | 96016           | 537                                  |
| 2 fraction         | 2 fraction      | 6684                                 |
| 5175 div.          | 192032          | 1509                                 |

## LONDON AND AMSTERDAM

*Through PARIS.*

A bill on Paris taken in London at 25 livres 15 sols tournois per pound sterling is remitted to Amsterdam, and negotiated at  $53\frac{1}{2}$  grotes Flemish banco for 3 francs: what is the proportional exchange between London and Amsterdam?

*Equation.*

|                      |                                  |
|----------------------|----------------------------------|
|                      | 1 pound sterling = $x$           |
| 1 pound sterling =   | 25 $\frac{1}{4}$ livres tournois |
| 81 livres tournois = | 80 francs                        |
| 3 francs =           | $53\frac{1}{2}$ grotes           |
| 12 grotes =          | 1 shilling Flemish.              |

*Rule.*—Multiply 20, fixed number, by the course of exchange between London and Paris, and by the course of Amsterdam on Paris; divide the product by 729, fixed number.

|                     |                                                   |
|---------------------|---------------------------------------------------|
| 20                  | 729)27552 $\frac{1}{2}$ (37 $9\frac{1}{2}$ result |
| 25 $\frac{1}{4}$    | 5682                                              |
| 515                 | 579                                               |
| 53 $\frac{1}{2}$    | 12                                                |
| 1545                | 6954                                              |
| 2575                | 398                                               |
| 257 $\frac{1}{2}$   |                                                   |
| 27552 $\frac{1}{2}$ |                                                   |



*Recapitulation of the Proportional Exchange between LONDON and AMSTERDAM.*

|                                                         |    |                   |
|---------------------------------------------------------|----|-------------------|
| Through Genoa it comes out at .....                     | 37 | 11 $\frac{1}{2}$  |
| Hamburg .....                                           | 37 | 21 $\frac{1}{4}$  |
| Leghorn .....                                           | 37 | 11 $\frac{1}{2}$  |
| Lisbon will answer to draw .....                        | 35 | 10 $\frac{2}{3}$  |
| Madrid .....                                            | 37 | 11 $\frac{5}{16}$ |
| Paris will answer to remit .....                        | 37 | 91 $\frac{1}{2}$  |
| <i>Direct course between London and Amsterdam</i> ..... | 37 | 3                 |

*Application to Remit.*

It appears by the comparison of the above-mentioned exchanges, that the proportional exchange upon Paris is the highest, and consequently that it would be more advantageous to remit to Amsterdam by that place than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 37 91 $\frac{1}{2}$ , instead of the direct, 37 3; so that a merchant would receive 37 shillings 9 $\frac{1}{2}$  grotes Flemish in exchange for one pound sterling.

|                                                                    |         |
|--------------------------------------------------------------------|---------|
| 37 3 direct course : 37 91 $\frac{1}{2}$ indirect course :: £100 : | 101 9 1 |
| Less for charges, at $\frac{3}{4}$ per cent .....                  | 0 15 0  |
| Advantage resulting from the arbitration ..                        | 0 14 1  |
|                                                                    | <hr/>   |
|                                                                    | 100 0 0 |

*Application to Draw.*

If a merchant at London had to value on Amsterdam, instead of drawing directly, he would order his correspondent at Amsterdam to take a bill on Lisbon at 44 $\frac{1}{2}$ , and either to remit it thither to provide for drafts from London upon Lisbon at 62, or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 35 10 $\frac{2}{3}$ , instead of the direct, 37 3; so that a merchant would give only 35 shillings 10 $\frac{2}{3}$  grotes Flemish for one pound sterling.

|                                                                    |         |
|--------------------------------------------------------------------|---------|
| 37 3 direct course : 35 10 $\frac{2}{3}$ indirect course :: £100 : | 96 6 10 |
| Add for charges, at $\frac{3}{4}$ per cent .....                   | 0 15 0  |
| Advantage resulting from the arbitration ..                        | 2 18 2  |
|                                                                    | <hr/>   |
|                                                                    | 100 0 0 |



## LONDON AND GENOA.

*Proportional Exchange.*

|                 | Quotation at London. | Quotation from Genoa. |
|-----------------|----------------------|-----------------------|
| On Genoa .....  | 46                   |                       |
| Amsterdam ..... | 37 4                 | 84 $\frac{1}{8}$      |
| Hamburg .....   | 35 4                 | 46 $\frac{1}{4}$      |
| Leghorn .....   | 50                   | 124 $\frac{1}{2}$     |
| Lisbon .....    | 61 $\frac{1}{2}$     | 765                   |
| Madrid .....    | 34 $\frac{3}{4}$     | 660                   |
| Paris .....     | 25 2                 | 94 $\frac{7}{8}$      |

*Observation.*

London gives the uncertain price to Genoa ; that is, 46 pence sterling, more or less, for 1 pezza fuori di banco ; therefore, when London remits to Genoa, that place through which the lowest course of exchange can be obtained is to be preferred, because less pence will be given in exchange for one pezza. On the contrary, when London has to draw upon Genoa, that place should be chosen which furnishes the highest course, because more pence will be received in exchange for a pezza.

If you include the charges in the operation, insert, for an indirect remittance, 100 less the charges in the divisor, and 100 in the dividend ; and, for an indirect draft, place 100 more the charges in the divisor, and 100 in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND GENOA

*Through AMSTERDAM.*

A bill on Amsterdam taken in London at 37 shillings 4 grotes Flemish banco per pound sterling is remitted to Genoa, and negotiated at  $84\frac{7}{8}$  grotes Flemish banco per pezza, of  $5\frac{3}{4}$  lire fuori di banco: what is the proportional exchange between London and Genoa?

|                                   |   |                        |
|-----------------------------------|---|------------------------|
| <i>Equation.</i>                  |   | 1 pezza = $x$          |
| 1 pezza                           | = | $84\frac{7}{8}$ grotes |
| 12 grotes                         | = | 1 shilling Flemish     |
| $37\frac{1}{2}$ shillings Flemish | = | 1 pound sterling       |
| 1 pound sterling                  | = | 240 pence.             |

*Rule.*—Multiply 20, fixed number, by the course of exchange between Genoa and Amsterdam; and divide the product by the course of London on Amsterdam.

|                 |                                                 |
|-----------------|-------------------------------------------------|
| $37\frac{1}{2}$ | 20                                              |
| 3 fraction      | $84\frac{7}{8}$                                 |
| 112 div.        | 1680                                            |
|                 | $17\frac{1}{2}$                                 |
|                 | 1697 $\frac{1}{2}$                              |
|                 | 3 fraction                                      |
|                 | 112)5092 $\frac{1}{2}$ (45 $\frac{1}{2}$ result |
|                 | 612                                             |
|                 | 52                                              |

## LONDON AND GENOA

*Through HAMBURG.*

A bill on Hamburg taken in London at 35 shillings 4 grotes Flemish banco per pound sterling is remitted to Genoa, and negotiated at  $46\frac{1}{4}$  soldi fuori di banco per marc lubs banco: what is the proportional exchange between London and Genoa?

|                                   |   |                     |
|-----------------------------------|---|---------------------|
| <i>Equation.</i>                  |   | 1 pezza = $x$       |
| 1 pezza                           | = | 115 soldi           |
| $46\frac{1}{4}$ soldi             | = | 1 marc banco        |
| 3 marcs                           | = | 8 shillings Flemish |
| $35\frac{3}{8}$ shillings Flemish | = | 1 pound sterling    |
| 1 pound sterling                  | = | 240 pence sterling. |

*Rule.*—Divide 73600, fixed number, by the course of exchange between London and Hamburg, multiplied by the course of Genoa on Hamburg.

|                 |                       |
|-----------------|-----------------------|
| $35\frac{3}{8}$ | 73600                 |
| 6 fraction      | 6 fraction            |
| 212             | 9805)441600(45 result |
| $46\frac{1}{4}$ | 49400                 |
| 1272            | 375                   |
| 848             |                       |
| 53              |                       |
| 9805 div.       |                       |



## LONDON AND GENOA

*Through* LEGHORN.

A bill on Leghorn taken in London at 50 pence sterling per pezza of 8 reals is remitted to Genoa, and negotiated at  $124\frac{1}{2}$  soldi fuori di banco per pezza of 8 reals: what is the proportional exchange between London and Genoa?

*Equation.*

$$\begin{aligned} 1 \text{ pezza fuori di banco} &= x \\ 1 \text{ pezza fuori di banco} &= 115 \text{ soldi ditto} \\ 124\frac{1}{2} \text{ soldi ditto} &= 1 \text{ pezza of 8 reals} \\ 1 \text{ pezza of 8 reals} &= 50 \text{ pence sterling.} \end{aligned}$$

*Rule.*—Multiply 115, fixed number, by the course of exchange between London and Leghorn; and divide the product by the course of Genoa on Leghorn.

$$\begin{array}{r} 124\frac{1}{2} \\ 2 \text{ fraction} \\ \hline 249 \text{ div.} \end{array} \quad \begin{array}{r} 115 \\ 50 \\ \hline 5750 \\ 2 \text{ fraction} \\ \hline 249)11500(46\frac{3}{16} \text{ result} \\ 1540 \\ 46 \end{array}$$

## LONDON AND GENOA

*Through* LISBON.

A bill on Lisbon taken in London at  $61\frac{1}{2}$  pence sterling per mil-reis is remitted to Genoa, and negotiated at 765 reis per pezza of 115 soldi fuori di banco: what is the proportional exchange between London and Genoa?

*Equation.*

$$\begin{aligned} 1 \text{ pezza} &= x \\ 1 \text{ pezza} &= 765 \text{ reis} \\ 1000 \text{ reis} &= 61\frac{1}{2} \text{ pence.} \end{aligned}$$

*Rule.*—Multiply the course of exchange between Genoa and Lisbon by the course of London on Lisbon; and divide the product by 1000, fixed number.

$$\begin{array}{r} 765 \\ 61\frac{1}{2} \\ \hline 765 \\ 4590 \\ 382\frac{1}{2} \\ \hline 1,000)47,047\frac{1}{2}(47\frac{1}{2} \text{ result.} \\ L \end{array}$$



## LONDON AND GENOA

*Through MADRID.*

A bill on Madrid taken in London at  $34\frac{3}{4}$  pence sterling per dollar of exchange is remitted to Genoa, and negotiated at 660 maravedis per gold crown: what is the proportional exchange between London and Genoa?

*Equation.*1 pezza =  $x$ 

1 pezza = 115 soldi

214 soldi = 1 gold crown

1 gold crown = 660 maravedis

272 maravedis = 1 dollar

1 dollar =  $34\frac{3}{4}$  pence.

*Rule.*—Multiply 115, fixed number, by the course of exchange between Genoa and Madrid, and by the course of London on Madrid; divide the product by 58208, fixed number.

$$\begin{array}{r}
 115 \\
 660 \\
 \hline
 6900 \\
 690 \\
 \hline
 75900 \\
 34\frac{3}{4} \\
 \hline
 303600 \\
 227700 \\
 \hline
 56925 \\
 58208 \overline{) 2637525} (45\frac{5}{16} \text{ result} \\
 \underline{309205} \\
 18165
 \end{array}$$

## LONDON AND GENOA

*Through PARIS.*

A bill on Paris taken in London at 25 livres 2 sols tournois per pound sterling is remitted to Genoa, and negotiated at  $94\frac{7}{8}$  sols in francs per pezza of 115 soldi fuori di banco: what is the proportional exchange between London and Genoa?

*Equation.*1 pezza =  $x$ 1 pezza =  $94\frac{7}{8}$  sols

20 sols = 1 franc

80 francs = 81 livres tournois

 $25\frac{1}{10}$  livres tournois = 1 pound sterling

1 pound sterling = 240 pence sterling.

*Rule.*—Multiply 243, fixed number, by the course of exchange between Genoa and Paris; and divide the product by 20, fixed number, multiplied by the course of London on Paris.

$$\begin{array}{r}
 20 \\
 25\frac{1}{10} \\
 \hline
 502 \text{ div.}
 \end{array}
 \qquad
 \begin{array}{r}
 243 \\
 94\frac{7}{8} \\
 \hline
 972 \\
 2187 \\
 121\frac{4}{8} \\
 60\frac{6}{8} \\
 30\frac{3}{8} \\
 \hline
 502 \overline{) 23054\frac{5}{8}} (45\frac{15}{16} \text{ result} \\
 \underline{2974} \\
 464
 \end{array}$$



*Recapitulation of the Proportional Exchange between LONDON and GENOA.*

|                                                     |                   |
|-----------------------------------------------------|-------------------|
| Through Amsterdam it comes out at.....              | 45 $\frac{1}{2}$  |
| Hamburg <i>will answer to remit</i> .....           | 45                |
| Leghorn .....                                       | 46 $\frac{3}{16}$ |
| Lisbon <i>will answer to draw</i> .....             | 47 $\frac{1}{21}$ |
| Madrid .....                                        | 45 $\frac{5}{16}$ |
| Paris .....                                         | 45 $\frac{1}{16}$ |
| <i>Direct course between London and Genoa</i> ..... | 46                |

*Application to Remit.*

It appears by the comparison of the abovementioned exchanges, that the proportional exchange upon Hamburg is the lowest, and, consequently, that it would be more advantageous to remit to Genoa by that place, than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 45, instead of the direct, 46; so that a merchant would give only 45 pence in exchange for one pezza fuori di banco.

|                                                       |         |    |   |
|-------------------------------------------------------|---------|----|---|
| 46 direct course : 45 indirect course :: £100 : ..... | 97      | 16 | 6 |
| Add for charges, at $\frac{3}{4}$ per cent .....      | 0       | 15 | 0 |
| Advantage resulting from the arbitration 1 8 6        | } 2 3 6 |    |   |
|                                                       | <hr/>   |    |   |
|                                                       | 100     | 0  | 0 |

*Application to Draw.*

If a merchant at London had to value on Genoa, instead of drawing directly, he would order his correspondent at Genoa to take a bill on Lisbon at 765, and either to remit it thither to provide for drafts from London upon Lisbon at 61 $\frac{1}{2}$ , or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 47 $\frac{1}{21}$ , instead of the direct, 46; so that a merchant would receive 47 $\frac{1}{21}$  pence in exchange for a pezza.

|                                                                     |         |    |   |
|---------------------------------------------------------------------|---------|----|---|
| 46 direct course : 47 $\frac{1}{21}$ indirect course :: £100 : .... | 102     | 5  | 7 |
| Less for charges, at $\frac{3}{4}$ per cent .....                   | 0       | 15 | 0 |
| Advantage resulting from the arbitration ..1 10 7                   | } 2 5 7 |    |   |
|                                                                     | <hr/>   |    |   |
|                                                                     | 100     | 0  | 0 |



## LONDON AND HAMBURG.

*Proportional Exchange.*

|                  | Quotation at London. | Quotation from Hamburg. |
|------------------|----------------------|-------------------------|
| On Hamburg ..... | 35                   |                         |
| Amsterdam .....  | 37 3                 | $34\frac{1}{4}$         |
| Genoa .....      | 45                   | 78                      |
| Leghorn .....    | $48\frac{1}{2}$      | $85\frac{3}{4}$         |
| Lisbon .....     | $61\frac{3}{4}$      | $41\frac{3}{4}$         |
| Madrid .....     | $34\frac{1}{2}$      | $82\frac{1}{2}$         |
| Paris .....      | 25 10                | $24\frac{7}{8}$         |

*Observation.*

London gives the certain price to Hamburg, that is, one pound sterling for so many shillings Flemish banco, more or less; therefore, when London remits to Hamburg, that place through which the highest course of exchange can be obtained is to be preferred, because more shillings Flemish will be received in exchange for one pound sterling. On the contrary, when London has to draw upon Hamburg, that place should be chosen which furnishes the lowest course, because less shillings Flemish will be given in exchange for a pound sterling.

If you include the charges in the operation, insert, for an indirect remittance, 100 in the divisor, and 100 less the charges in the dividend; and, for an indirect draft, place 100 in the divisor, and 100 more the charges in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND HAMBURG

*Through AMSTERDAM.*

A bill on Amsterdam taken in London at 37 shillings 3 grotes Flemish banco per pound sterling is remitted to Hamburg, and negotiated at  $34\frac{1}{4}$  stivers banco for 2 marcs lubs banco : what is the proportional exchange between London and Hamburg ?

*Equation.*

1 pound sterling =  $x$   
 1 pound sterling =  $37\frac{1}{4}$  shillings Flemish  
 1 shill. Flemish = 6 stivers  
 $34\frac{1}{4}$  stivers banco = 2 marcs banco  
 3 marcs = 8 shillings Flemish.

*Rule.*—Multiply 32, fixed number, by the course of exchange between London and Amsterdam ; and divide the product by the course of Hamburg on Amsterdam.

|                 |                 |                                    |
|-----------------|-----------------|------------------------------------|
| $34\frac{1}{4}$ | 32              | 137)4768(34 $9\frac{2}{3}$ result. |
| 4 fraction      | $37\frac{1}{4}$ | 658                                |
|                 |                 | 110                                |
| 137 div.        | 224             | 12                                 |
|                 | 96              |                                    |
|                 | 8               | 220                                |
|                 |                 | 110                                |
|                 | 1192            |                                    |
|                 | 4 fraction      | 1320                               |
|                 |                 | 87                                 |
|                 | 4768            |                                    |

## LONDON AND HAMBURG

*Through GENOA.*

A bill on Genoa taken in London at 45 pence sterling per pezza of 115 soldi fuori di banco is remitted to Hamburg, and negotiated at 78 grotes Flemish banco per pezza fuori di banco : what is the proportional exchange between London and Hamburg ?

*Equation.*

1 pound sterling =  $x$   
 1 pound sterling = 240 pence  
 45 pence = 1 pezza  
 1 pezza = 78 grotes  
 12 grotes = 1 shilling Flemish.

*Rule.*—Multiply 20, fixed number, by the course of exchange between Hamburg and Genoa ; and divide the product by the course of London on Genoa.

|      |                     |
|------|---------------------|
| 20   | 45)1560(34 8 result |
| 78   | 210                 |
|      | 30                  |
| 1560 | 12                  |
|      | 360                 |
|      | 0                   |



## LONDON AND HAMBURG

*Through LEGHORN.*

A bill on Leghorn taken in London at  $48\frac{1}{4}$  pence sterling per pezza of 8 reals is remitted to Hamburg, and negotiated at  $85\frac{1}{4}$  grotes Flemish banco per pezza of 8 reals : what is the proportional exchange between London and Hamburg ?

*Equation.* 1 pound sterling =  $x$   
 1 pound sterling = 240 pence  
 $48\frac{1}{4}$  pence = 1 pezza  
 1 pezza =  $85\frac{1}{4}$  grotes  
 12 grotes = 1 shilling Flemish.

*Rule.*—Multiply 20, fixed number, by the course of exchange between Hamburg and Leghorn ; and divide the product by the course of London on Leghorn.

|                 |                 |                                    |
|-----------------|-----------------|------------------------------------|
| $48\frac{1}{4}$ | 20              | 193)6860(35 $6\frac{1}{2}$ result. |
| 4 fraction      | $85\frac{1}{4}$ | 1070                               |
|                 |                 | 105                                |
| 193 div.        | 1700            | 12                                 |
|                 | 15              |                                    |
|                 |                 | 210                                |
|                 | 1715            | 105                                |
|                 | 4 fraction      |                                    |
|                 |                 | 1260                               |
|                 | 6860            | 102                                |

## LONDON AND HAMBURG

*Through LISBON.*

A bill on Lisbon taken in London at  $61\frac{1}{4}$  pence sterling per milreis is remitted to Hamburg, and negotiated at  $41\frac{3}{4}$  grotes Flemish banco per crusade of 400 reis : what is the proportional exchange between London and Hamburg ?

*Equation.* 1 pound sterling =  $x$   
 1 pound sterling = 240 pence  
 $61\frac{1}{4}$  pence = 1000 reis  
 400 reis =  $41\frac{3}{4}$  grotes  
 12 grotes = 1 shilling Flemish.

*Rule.*—Multiply 50, fixed number, by the course of exchange between Hamburg and Lisbon ; and divide the product by the course of London on Lisbon.

|                 |                  |                                    |
|-----------------|------------------|------------------------------------|
| $61\frac{1}{4}$ | 50               | 247)8350(33 $9\frac{1}{2}$ result. |
| 4 fraction      | $41\frac{3}{4}$  | 940                                |
|                 |                  | 199                                |
| 247 div.        | 2050             | 12                                 |
|                 | $37\frac{1}{2}$  |                                    |
|                 |                  | 398                                |
|                 | $208\frac{1}{2}$ | 199                                |
|                 | 4 fraction       |                                    |
|                 |                  | 2388                               |
|                 | 8350             | 165                                |



# LONDON AND HAMBURG Through MADRID.

A bill on Madrid taken in London at  $34\frac{1}{2}$  pence sterling per dollar of exchange is remitted to Hamburg, and negotiated at  $82\frac{1}{2}$  grotes Flemish banco per ducat of exchange: what is the proportional exchange between London and Hamburg?

*Equation.*

1 pound sterling =  $x$

1 pound sterling = 240 pence

$34\frac{1}{2}$  pence = 1 dollar

375 dollars = 272 ducats

1 ducat =  $82\frac{1}{2}$  grotes

12 grotes = 1 shilling Flemish.

*Rule.*—Multiply 1088, fixed number, by the course of exchange between Hamburg and Madrid; and divide the product by 75, fixed number, multiplied by the course of London on Madrid.

|                    |                 |                                      |
|--------------------|-----------------|--------------------------------------|
| 75                 | 1088            | 5175)179520(34 $8\frac{1}{4}$ result |
| $34\frac{1}{2}$    | $82\frac{1}{2}$ | 24270                                |
| 300                | 2176            | 3570                                 |
| 225                | 8704            | 12                                   |
| $37\frac{1}{2}$    | 544             | 7140                                 |
| 2587 $\frac{1}{2}$ | 89760           | 3570                                 |
| 2 fraction         | 2 fraction      | 42840                                |
| 5175 div.          | 179520          | 1440                                 |

# LONDON AND HAMBURG Through PARIS.

A bill on Paris taken in London at 25 livres 10 sols tournois per pound sterling is remitted to Hamburg, and negotiated at  $24\frac{7}{8}$  shillings lubs banco for 3 francs: what is the proportional exchange between London and Hamburg?

*Equation.*

1 pound sterling =  $x$

1 pound sterling =  $25\frac{1}{2}$  livres tournois

81 livres tournois = 80 francs

3 francs =  $24\frac{7}{8}$  shillings banco

6 shillings banco = 1 shilling Flemish.

*Rule.*—Multiply 40, fixed number, by the course of exchange between London and Paris, and by the course of Hamburg on Paris; divide the product by 729, fixed number.

|                     |                                                   |
|---------------------|---------------------------------------------------|
| 40                  | 729)25372 $\frac{1}{2}$ (34 $9\frac{3}{4}$ result |
| $25\frac{1}{2}$     | 3502                                              |
| 1020                | 586                                               |
| $24\frac{7}{8}$     | 12                                                |
| 4080                | 1178                                              |
| 2040                | 586                                               |
| 892 $\frac{1}{2}$   | 7038                                              |
| 25372 $\frac{1}{2}$ | 477                                               |



*Recapitulation of the Proportional Exchange between LONDON and HAMBURG.*

|                                                |    |                 |
|------------------------------------------------|----|-----------------|
| Through Amsterdam it comes out at .....        | 34 | 9 $\frac{2}{3}$ |
| Genoa .....                                    | 34 | 8               |
| Leghorn will answer to remit .....             | 35 | 6 $\frac{1}{2}$ |
| Lisbon will answer to draw .....               | 33 | 9 $\frac{2}{3}$ |
| Madrid .....                                   | 34 | 8 $\frac{1}{4}$ |
| Paris .....                                    | 34 | 9 $\frac{2}{3}$ |
| Direct course between London and Hamburg ..... | 35 |                 |

*Application to Remit.*

It appears by the comparison of the abovementioned exchanges, that the proportional exchange upon Leghorn is the highest, and, consequently, that it would be more advantageous to remit to Hamburg by that place, than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 35 6 $\frac{1}{2}$ , instead of the direct, 35; so that a merchant would receive 35 shillings 6 $\frac{1}{2}$  grotes Flemish for one pound sterling.

|                                                                 |     |    |    |
|-----------------------------------------------------------------|-----|----|----|
| 35 direct course : 35 6 $\frac{1}{2}$ indirect course :: £100 : | 101 | 10 | 11 |
| Less for charges, at $\frac{3}{4}$ per cent .....               | 0   | 15 | 0  |
| Advantage resulting from the arbitration                        | 0   | 15 | 11 |
|                                                                 | 100 | 0  | 0  |

*Application to Draw.*

If a merchant at London had to value on Hamburg, instead of drawing directly, he would order his correspondent at Hamburg to take a bill on Lisbon at 41 $\frac{3}{4}$ , and either to remit it thither to provide for drafts from London upon Lisbon at 61 $\frac{3}{4}$ , or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 33 9 $\frac{2}{3}$ , instead of the direct, 35; so that a merchant would give only 33 shillings 9 $\frac{2}{3}$  grotes Flemish in exchange for one pound sterling.

|                                                                 |     |    |   |
|-----------------------------------------------------------------|-----|----|---|
| 35 direct course : 33 9 $\frac{2}{3}$ indirect course :: £100 : | 96  | 11 | 8 |
| Add for charges, at $\frac{3}{4}$ per cent .....                | 0   | 15 | 0 |
| Advantage resulting from the arbitration                        | 2   | 13 | 4 |
|                                                                 | 100 | 0  | 0 |



## LONDON AND LEGHORN.

*Proportional Exchange.*

|                  | Quotation at London. | Quotation from Leghorn. |
|------------------|----------------------|-------------------------|
| On Leghorn ..... | 50                   |                         |
| Amsterdam .....  | 37 2                 | 92                      |
| Genoa .....      | 45 $\frac{3}{4}$     | 124                     |
| Hamburg .....    | 35 1                 | 86 $\frac{1}{4}$        |
| Lisbon .....     | 61 $\frac{1}{2}$     | 830                     |
| Madrid .....     | 35                   | 142                     |
| Paris .....      | 24 15                | 104                     |

*Observation.*

London gives the uncertain price to Leghorn; that is, 50 pence sterling, more or less, for one pezza of 8 reals; therefore, when London remits to Leghorn, that place through which the lowest course of exchange can be obtained is to be preferred, because less pence will be given in exchange for one pezza. On the contrary, when London has to draw upon Leghorn, that place should be chosen which furnishes the highest course, because more pence will be received in exchange for a pezza.

If you include the charges in the operation, insert, for an indirect remittance, 100 less the charges in the divisor, and 100 in the dividend; and, for an indirect draft, place 100 more the charges in the divisor, and 100 in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND LEGHORN

*Through* AMSTERDAM.

A bill on Amsterdam taken in London at 37 shillings 2 grotes Flemish banco per pound sterling is remitted to Leghorn, and negotiated at 92 grotes Flemish banco per pezza of 8 reals : what is the proportional exchange between London and Leghorn ?

*Equation.*

|                                   |                       |
|-----------------------------------|-----------------------|
|                                   | 1 pezza = $x$         |
| 1 pezza                           | = 92 grotes           |
| 12 grotes                         | = 1 shilling Flemish  |
| $37\frac{1}{2}$ shillings Flemish | = 1 pound sterling    |
| 1 pound sterling                  | = 240 pence sterling. |

*Rule.*—Multiply 20, fixed number, by the course of exchange between Leghorn and Amsterdam ; and divide the product by the course of London on Amsterdam.

|                                    |            |
|------------------------------------|------------|
| $37\frac{1}{2}$                    | 20         |
| 6 fraction                         | 92         |
| <hr/>                              |            |
| 223 div.                           | 1840       |
|                                    | 6 fraction |
| <hr/>                              |            |
| 223)11040(49 $\frac{1}{2}$ result. |            |
|                                    | 2120       |
|                                    | 113        |
|                                    | <hr/>      |

## LONDON AND LEGHORN

*Through* GENOA.

A bill on Genoa taken in London at 45 $\frac{3}{4}$  pence sterling per pezza of 115 soldi fuori di banco is remitted to Lisbon, and negotiated at 124 soldi fuori di banco per pezza of 8 reals : what is the proportional exchange between London and Leghorn ?

*Equation.*

|                          |                                    |
|--------------------------|------------------------------------|
|                          | 1 pezza of 8 reals = $x$           |
| 1 pezza of 8 reals       | = 124 soldi fuori di banco         |
| 115 soldi fuori di banco | = 1 pezza ditto                    |
| 1 pezza ditto            | = 45 $\frac{3}{4}$ pence sterling. |

*Rule.*—Multiply the course of exchange between Leghorn and Genoa by the course of London on Genoa ; and divide the product by 115, fixed number.

|                  |                                   |
|------------------|-----------------------------------|
| 124              | 115)5673(49 $\frac{1}{2}$ result. |
| 45 $\frac{3}{4}$ | 1073                              |
| <hr/>            |                                   |
| 620              | 38                                |
| 496              |                                   |
| 62               |                                   |
| 31               |                                   |
| <hr/>            |                                   |
| 5673             |                                   |



## LONDON AND LEGHORN

*Through HAMBURG.*

A bill on Hamburg taken in London at 35 shillings 1 grote Flemish banco per pound sterling is remitted to Leghorn, and negotiated at  $86\frac{1}{4}$  grotes Flemish banco per pezza of 8 reals: what is the proportional exchange between London and Leghorn?

*Equation.*

$$\begin{array}{rcl}
 1 \text{ pezza} & = & x \\
 1 \text{ pezza} & = & 86\frac{1}{4} \text{ grotes} \\
 12 \text{ grotes} & = & 1 \text{ shilling Flemish} \\
 35\frac{1}{2} \text{ shillings Flemish} & = & 1 \text{ pound sterling} \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling.}
 \end{array}$$

*Rule.*—Multiply 20, fixed number, by the course of exchange between Leghorn and Hamburg; and divide the product by the course of London on Hamburg.

$$\begin{array}{r}
 35\frac{1}{2} \\
 12 \text{ fraction} \\
 \hline
 71 \\
 35 \\
 \hline
 421 \text{ divisor}
 \end{array}
 \begin{array}{r}
 20 \\
 86\frac{1}{4} \\
 \hline
 1720 \\
 5 \\
 \hline
 1725 \\
 12 \text{ fraction} \\
 \hline
 3450 \\
 1725 \\
 \hline
 421 \overline{)20700} (49\frac{1}{6} \text{ result.} \\
 3860 \\
 71 \\
 \hline
 \hline
 \end{array}$$

## LONDON AND LEGHORN

*Through LISBON.*

A bill on Lisbon taken in London at  $61\frac{1}{2}$  pence sterling per mil-reis is remitted to Leghorn, and negotiated at 830 reis per pezza of 8 reals: what is the proportional exchange between London and Leghorn?

*Equation.*

$$\begin{array}{rcl}
 1 \text{ pezza} & = & x \\
 1 \text{ pezza} & = & 830 \text{ reis} \\
 1000 \text{ reis} & = & 61\frac{1}{2} \text{ pence.}
 \end{array}$$

*Rule.*—Multiply the course of exchange between Leghorn and Lisbon by the course of London on Lisbon; and divide the product by 1000, fixed number.

$$\begin{array}{r}
 830 \\
 61\frac{1}{2} \\
 \hline
 830 \\
 4980 \\
 415 \\
 \hline
 1,000 \overline{)51,045} (51\frac{1}{2} \text{ result.}
 \end{array}$$



## LONDON AND LEGHORN

*Through MADRID.*

A bill on Madrid taken in London at 35 pence sterling per dollar of exchange is remitted to Leghorn, and negotiated at 142 dollars of exchange for 100 pezze of 8 reals : what is the proportional exchange between London and Leghorn ?

*Equation.*

$$\begin{aligned} 1 \text{ pezza} &= x \\ 100 \text{ pezze} &= 142 \text{ dollars} \\ 1 \text{ dollar} &= 35 \text{ pence.} \end{aligned}$$

*Rule.*—Multiply the course of exchange between Leghorn and Madrid by the course of London on Madrid ; and divide the product by 100, fixed number.

$$\begin{array}{r} 142 \\ 35 \\ \hline 710 \\ 426 \\ \hline 1,00 \overline{)49,70(49\frac{7}{10} \text{ result.}} \end{array}$$

## LONDON AND LEGHORN

*Through PARIS.*

A bill on Paris taken in London at 24 livres 15 sols tournois per pound sterling is remitted to Leghorn, and negotiated at 104 sols in francs per pezza of 8 reals : what is the proportional exchange between London and Leghorn ?

*Equation.*

$$\begin{aligned} 1 \text{ pezza} &= x \\ 1 \text{ pezza} &= 104 \text{ sols} \\ 20 \text{ sols} &= 1 \text{ franc} \\ 80 \text{ francs} &= 81 \text{ livres tournois} \\ 24\frac{3}{4} \text{ livres tournois} &= 1 \text{ pound sterling} \\ 1 \text{ pound sterling} &= 240 \text{ pence sterling.} \end{aligned}$$

*Rule.*—Multiply 243, fixed number, by the course of exchange between Leghorn and Paris ; and divide the product by 20, fixed number, multiplied by the course of London on Paris.

$$\begin{array}{r} 20 \\ 24\frac{3}{4} \\ \hline 480 \\ 15 \\ \hline 495 \text{ div.} \end{array} \quad \begin{array}{r} 243 \\ 104 \\ \hline 972 \\ 2430 \\ \hline 495 \overline{)25272(51\frac{1}{8} \text{ result.}} \\ 522 \\ 27 \end{array}$$



*Recapitulation of the Proportional Exchange between LONDON and  
LEGHORN.*

|                                                |                   |
|------------------------------------------------|-------------------|
| Through Amsterdam it comes out at .....        | 49 $\frac{1}{2}$  |
| Genoa .....                                    | 49 $\frac{1}{3}$  |
| Hamburg will answer to remit .....             | 49 $\frac{1}{6}$  |
| Lisbon .....                                   | 51 $\frac{1}{12}$ |
| Madrid .....                                   | 49 $\frac{7}{10}$ |
| Paris will answer to draw .....                | 51 $\frac{1}{18}$ |
| Direct course between London and Leghorn ..... | 50                |

*Application to Remit.*

It appears by the comparison of the abovementioned exchanges, that the proportional exchange upon Hamburg is the lowest, and, consequently, that it would be more advantageous to remit to Leghorn by that place than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 49 $\frac{1}{6}$ , instead of the direct, 50; so that a merchant would give only 49 $\frac{1}{6}$  pence sterling in exchange for one pezza of 8 reals.

|                                                                    |       |    |   |
|--------------------------------------------------------------------|-------|----|---|
| 50 direct course : 49 $\frac{1}{6}$ indirect course :: £100 : .... | 98    | 6  | 8 |
| Add for charges, at $\frac{3}{4}$ per cent .....                   | 0     | 15 | 0 |
| Advantage resulting from the arbitration ..                        | 0     | 18 | 4 |
|                                                                    | <hr/> |    |   |
|                                                                    | 100   | 0  | 0 |

*Application to Draw.*

If a merchant at London had to value on Leghorn, instead of drawing directly, he would order his correspondent at Leghorn to take a bill on Paris at 104, and either to remit it thither to provide for drafts from London upon Paris at 24 15, or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 51 $\frac{1}{18}$ , instead of the direct, 50; so that a merchant would receive 51 $\frac{1}{18}$  pence in exchange for a pezza.

|                                                                   |       |    |   |
|-------------------------------------------------------------------|-------|----|---|
| 50 direct course : 51 $\frac{1}{18}$ indirect course :: £100 : .. | 102   | 2  | 2 |
| Less for charges, at $\frac{3}{4}$ per cent .....                 | 0     | 15 | 0 |
| Advantage resulting from the arbitration 1                        | 7     | 2  |   |
|                                                                   | <hr/> |    |   |
|                                                                   | 100   | 0  | 0 |



## LONDON AND LISBON.

*Proportional Exchange.*

|                 | Quotation at London. | Quotation from Lisbon. |
|-----------------|----------------------|------------------------|
| On Lisbon ..... | 61                   |                        |
| Amsterdam ..... | 36 10                | 46½                    |
| Genoa .....     | 45½                  | 730                    |
| Hamburg .....   | 34 10                | 44                     |
| Leghorn .....   | 49                   | 830                    |
| Madrid .....    | 34½                  | 2250                   |
| Paris .....     | 24 18                | 460                    |

*Observation.*

London gives the uncertain price to Lisbon, that is, 61 pence sterling, more or less, for 1000 reis; therefore, when London remits to Lisbon, that place through which the lowest course of exchange can be obtained is to be preferred, because less pence will be given in exchange for milreis. On the contrary, when London has to draw upon Lisbon, that place should be chosen which furnishes the highest course, because more pence will be received in exchange for milreis.

If you include the charges in the equation, insert, for an indirect remittance, 100 less the charges in the divisor, and 100 in the dividend; and, for an indirect draft, place 100 more the charges in the divisor, and 100 in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND LISBON

*Through AMSTERDAM.*

A bill on Amsterdam taken in London at 36 shillings 10 grotes Flemish banco per pound sterling is remitted to Lisbon, and negotiated at  $46\frac{1}{2}$  grotes Flemish banco per crusade of 400 reis: what is the proportional exchange between London and Lisbon?

*Equation.*

$$\begin{array}{rcl}
 400 \text{ reis} & = & 46\frac{1}{2} \text{ grotes} \\
 12 \text{ grotes} & = & 1 \text{ shilling Flemish} \\
 36\frac{5}{8} \text{ shillings Flemish} & = & 1 \text{ pound sterling} \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling.}
 \end{array}$$

*Rule.*—Multiply 50, fixed number, by the course of exchange between Lisbon and Amsterdam; and divide the product by the course of London on Amsterdam.

$$\begin{array}{r}
 36\frac{5}{8} \\
 6 \text{ fraction} \\
 \hline
 221 \text{ divisor}
 \end{array}
 \qquad
 \begin{array}{r}
 50 \\
 46\frac{1}{2} \\
 \hline
 2300 \\
 25 \\
 \hline
 2325 \\
 6 \text{ fraction} \\
 221 \overline{)13950} (63\frac{1}{8} \text{ result.} \\
 690 \\
 27
 \end{array}$$

## LONDON AND LISBON

*Through GENOA.*

A bill on Genoa taken in London at  $45\frac{1}{2}$  pence sterling per pezza of 115 soldi fuori di banco is remitted to Lisbon, and negotiated at 730 reis per pezza fuori di banco: what is the proportional exchange between London and Lisbon?

*Equation.*

$$\begin{array}{rcl}
 730 \text{ reis} & = & 1 \text{ pezza} \\
 1 \text{ pezza} & = & 45\frac{1}{2} \text{ pence.}
 \end{array}$$

*Rule.*—Multiply 1000, fixed number, by the course of exchange between London and Genoa; and divide the product by the course of Lisbon on Genoa.

$$\begin{array}{r}
 1000 \\
 45\frac{1}{2} \\
 \hline
 45000 \\
 500 \\
 \hline
 730 \overline{)45500} (62\frac{1}{3} \text{ result.} \\
 1700 \\
 240
 \end{array}$$



## LONDON AND LISBON

*Through HAMBURG.*

A bill on Hamburg taken in London at 34 shillings 10 grotes Flemish banco per pound sterling is remitted to Lisbon, and negotiated at 44 grotes Flemish banco per crusade of 400 reis: what is the proportional exchange between London and Lisbon?

*Equation.*

$$\begin{array}{rcl}
 & & 1000 \text{ reis} = x \\
 400 \text{ reis} & = & 44 \text{ grotes} \\
 12 \text{ grotes} & = & 1 \text{ shilling Flemish} \\
 34\frac{5}{8} \text{ shillings Flemish} & = & 1 \text{ pound sterling} \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling.}
 \end{array}$$

*Rule.*—Multiply 50, fixed number, by the course of exchange between Lisbon and Hamburg; and divide the product by the course of London on Hamburg.

$$\begin{array}{r}
 34\frac{5}{8} \\
 6 \text{ fraction} \\
 \hline
 209 \text{ divisor}
 \end{array}
 \qquad
 \begin{array}{r}
 50 \\
 44 \\
 \hline
 2200 \\
 \text{fraction} \\
 \hline
 209 \overline{)13200} (63\frac{5}{8} \text{ result.} \\
 \underline{660} \\
 33
 \end{array}$$

## LONDON AND LISBON

*Through LEGHORN.*

A bill on Leghorn taken in London at 49 pence sterling per pezza of 8 reals is remitted to Lisbon, and negotiated at 830 reis per pezza of 8 reals: what is the proportional exchange between London and Lisbon?

*Equation.*

$$\begin{array}{rcl}
 & & 1000 \text{ reis} = x \\
 830 \text{ reis} & = & 1 \text{ pezza} \\
 1 \text{ pezza} & = & 49 \text{ pence.}
 \end{array}$$

*Rule.*—Multiply 1000, fixed number, by the course of exchange between London and Leghorn; and divide the product by the course of Lisbon on Leghorn.

$$\begin{array}{r}
 1000 \\
 49 \\
 \hline
 830 \overline{)49000} (59\frac{1}{8} \text{ result.} \\
 \underline{7500} \\
 30
 \end{array}$$



## LONDON AND LISBON

*Through MADRID.*

A bill on Madrid taken in London at  $34\frac{1}{2}$  pence sterling per dollar of exchange is remitted to Lisbon, and negotiated at 2250 reis per pistole of exchange: what is the proportional exchange between London and Lisbon?

*Equation.*

$$\begin{array}{rcl}
 & & 1000 \text{ reis} = x \\
 2250 \text{ reis} & = & 1 \text{ pistole} \\
 1 \text{ pistole} & = & 4 \text{ dollars} \\
 1 \text{ dollar} & = & 34\frac{1}{2} \text{ pence.}
 \end{array}$$

*Rule.*—Multiply 4000, fixed number, by the course of exchange between London and Madrid; and divide the product by the course of Lisbon on Madrid.

$$\begin{array}{r}
 4000 \\
 34\frac{1}{2} \\
 \hline
 136000 \\
 2000 \\
 \hline
 2250 \overline{)138000} (61\frac{1}{3} \text{ result.} \\
 3000 \\
 750
 \end{array}$$

## LONDON AND LISBON

*Through PARIS.*

A bill on Paris taken in London at 24 livres 18 sols tournois per pound sterling is remitted to Lisbon, and negotiated at 460 reis for 3 francs: what is the proportional exchange between London and Lisbon?

*Equation.*

$$\begin{array}{rcl}
 & & 1000 \text{ reis} = x \\
 460 \text{ reis} & = & 3 \text{ francs} \\
 80 \text{ francs} & = & 81 \text{ livres tournois} \\
 24\frac{9}{10} \text{ livres tournois} & = & 1 \text{ pound sterling} \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling.}
 \end{array}$$

*Rule.*—Divide 729000, fixed number, by the course of exchange between Lisbon and Paris, multiplied by the course of London on Paris.

$$\begin{array}{r}
 460 \\
 24\frac{9}{10} \\
 \hline
 1840 \\
 920 \\
 230 \\
 92 \\
 92 \\
 \hline
 11454 \text{ div.}
 \end{array}
 \quad
 \begin{array}{r}
 11454 \overline{)729000} (63\frac{2}{3} \text{ result.} \\
 41760 \\
 7398
 \end{array}$$



*Recapitulation of the Proportional Exchange between LONDON and LISBON.*

|                                                      |                   |
|------------------------------------------------------|-------------------|
| Through Amsterdam it comes out at .....              | 63 $\frac{1}{8}$  |
| Genoa .....                                          | 62 $\frac{1}{3}$  |
| Hamburg .....                                        | 63 $\frac{5}{32}$ |
| Leghorn <i>will answer to remit</i> .....            | 59 $\frac{1}{27}$ |
| Madrid .....                                         | 61 $\frac{1}{3}$  |
| Paris <i>will answer to draw</i> .....               | 63 $\frac{2}{3}$  |
| <i>Direct course between London and Lisbon</i> ..... | 61                |

*Application to Remit.*

It appears by the comparison of the abovementioned exchanges, that the proportional exchange upon Leghorn is the lowest, and, consequently, that it would be more advantageous to remit to Lisbon by that place than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 59 $\frac{1}{27}$ , instead of the direct, 61; so that a merchant would give only 59 $\frac{1}{27}$  pence sterling in exchange for milreis.

|                                                                   |                |
|-------------------------------------------------------------------|----------------|
| 61 direct course : 59 $\frac{1}{27}$ indirect course :: £100 : .. | 96 15 7        |
| Add for charges, at $\frac{3}{4}$ per cent .....                  | 0 15 0 } 3 4 5 |
| Advantage resulting from the arbitration..                        | 2 9 5 }        |
|                                                                   | <hr/> 100 0 0  |

*Application to Draw.*

If a merchant at London had to value on Lisbon, instead of drawing directly, he would order his correspondent at Lisbon to take a bill on Paris at 460, and either to remit it thither to provide for drafts from London upon Paris at 24 18, or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 63 $\frac{2}{3}$ , instead of the direct, 61; so that a merchant would receive 63 $\frac{2}{3}$  pence in exchange for milreis.

|                                                                  |                |
|------------------------------------------------------------------|----------------|
| 61 direct course : 63 $\frac{2}{3}$ indirect course :: £100 : .. | 104 7 5        |
| Less for charges, at $\frac{3}{4}$ per cent .....                | 0 15 0 } 4 7 5 |
| Advantage resulting from the arbitration..                       | 3 12 5 }       |
|                                                                  | <hr/> 100 0 0  |



## LONDON AND MADRID.

*Proportional Exchange.*

|                 | Quotation at London. | Quotation from Madrid. |
|-----------------|----------------------|------------------------|
| On Madrid ..... | 35½                  |                        |
| Amsterdam ..... | 37 6                 | 88½                    |
| Genoa .....     | 45½                  | 126½                   |
| Hamburg .....   | 35 2                 | 83                     |
| Leghorn .....   | 50                   | 136                    |
| Lisbon .....    | 62                   | 2300                   |
| Paris .....     | 25 5                 | 15 6                   |

*Observation.*

London gives the uncertain price to Madrid, that is, 35½ pence sterling, more or less, for one dollar of exchange; therefore, when London remits to Madrid, that place through which the lowest course of exchange can be obtained is to be preferred, because less pence will be given in exchange for one dollar of exchange. On the contrary, when London has to draw upon Madrid, that place should be chosen which furnishes the highest course, because more pence will be received in exchange for a dollar.

If you include the charges in the equation, insert, for an indirect remittance, 100 less the charges in the divisor, and 100 in the dividend; and, for an indirect draft, place 100 more the charges in the divisor, and 100 in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND MADRID

*Through* AMSTERDAM.

A bill on Amsterdam taken in London at 37 shillings 6 grotes Flemish banco per pound sterling is remitted to Madrid, and negotiated at  $88\frac{1}{2}$  grotes Flemish banco per ducat of exchange: what is the proportional exchange between London and Madrid?

*Equation.*

|                                   |                          |
|-----------------------------------|--------------------------|
|                                   | 1 dollar = $x$           |
| 375 dollars                       | = 272 ducats             |
| 1 ducat                           | = $88\frac{1}{2}$ grotes |
| 12 grotes                         | = 1 shilling Flemish     |
| $37\frac{1}{2}$ shillings Flemish | = 1 pound sterling       |
| 1 pound sterling                  | = 240 pence sterling.    |

*Rule.*—Multiply 1088, fixed number, by the course of exchange between Madrid and Amsterdam; and divide the product by 75, fixed number, multiplied by the course of London on Amsterdam.

|                    |                                     |
|--------------------|-------------------------------------|
| 75                 | 1088                                |
| $37\frac{1}{2}$    | $88\frac{1}{2}$                     |
| 525                | 8704                                |
| 225                | 8704                                |
| $37\frac{1}{2}$    | 544                                 |
| 2812 $\frac{1}{2}$ | 96288                               |
| 2 fraction         | 2 fraction                          |
| 5625 divisor       | 5625)192576(34 $\frac{1}{2}$ result |
|                    | 23826                               |
|                    | 1326                                |

## LONDON AND MADRID

*Through* GENOA.

A bill on Genoa taken in London at 45 $\frac{1}{2}$  pence sterling per pezza of 115 soldi fuori di banco is remitted to Paris, and negotiated at 126 $\frac{1}{2}$  dollars of exchange for 100 pezze fuori di banco: what is the proportional exchange between London and Madrid?

*Equation.*

|                           |                           |
|---------------------------|---------------------------|
|                           | 1 dollar = $x$            |
| 126 $\frac{1}{2}$ dollars | = 100 pezze               |
| 1 pezza                   | = 45 $\frac{1}{2}$ pence. |

*Rule.*—Multiply 100, fixed number, by the course of exchange between London and Genoa; and divide the product by the course of Madrid on Genoa.

|                   |                                  |
|-------------------|----------------------------------|
| 126 $\frac{1}{2}$ | 100                              |
| 2 fraction        | 45 $\frac{1}{2}$                 |
| 253 div.          | 4500                             |
|                   | 50                               |
|                   | 4550                             |
|                   | 2 fraction                       |
|                   | 253)9100(35 $\frac{3}{4}$ result |
|                   | 1510                             |
|                   | 245                              |



## LONDON AND MADRID

*Through HAMBURG.*

A bill on Hamburg taken in London at 35 shillings 2 grotes Flemish banco per pound sterling is remitted to Madrid, and negotiated at 83 grotes Flemish banco per ducat of exchange: what is the proportional exchange between London and Madrid?

*Equation.*1 dollar =  $x$ 

375 dollars = 272 ducats

1 ducat = 83 grotes

12 grotes = 1 shilling Flemish

35 $\frac{1}{6}$  shillings Flemish = 1 pound sterling

1 pound sterling = 240 pence sterling.

*Rule.*—Multiply 1088, fixed number, by the course of exchange between Madrid and Hamburg; and divide the product by 75, fixed number, multiplied by the course of London on Hamburg.

|                    |                                     |
|--------------------|-------------------------------------|
| 75                 | 1088                                |
| 35 $\frac{1}{6}$   | 83                                  |
| —                  | —                                   |
| 375                | 3264                                |
| 225                | 8704                                |
| 12 $\frac{1}{2}$   | —                                   |
| —                  | 90304                               |
| 2637 $\frac{1}{2}$ | 2 fraction                          |
| 2 fraction         | —                                   |
| —                  | 5275)180608(34 $\frac{1}{4}$ result |
| 5275 divisor       | 22358                               |
|                    | 1258                                |

## LONDON AND MADRID

*Through LEGHORN.*

A bill on Leghorn taken in London at 50 pence sterling per pezza of 8 reals is remitted to Madrid, and negotiated at 136 dollars of exchange for 100 pezze of 8 reals: what is the proportional exchange between London and Madrid?

*Equation.*1 dollar =  $x$ 

136 dollars = 100 pezze

1 pezza = 50 pence.

*Rule.*—Multiply 100, fixed number, by the course of exchange between London and Leghorn; and divide the product by the course of Madrid on Leghorn.

|                                  |
|----------------------------------|
| 100                              |
| 50                               |
| —                                |
| 136)5000(36 $\frac{1}{4}$ result |
| 920                              |
| 104                              |



## LONDON AND MADRID

*Through LISBON.*

A bill on Lisbon taken in London at 62 pence sterling per milreis is remitted to Madrid, and negotiated at 2300 reis per pistole of exchange : what is the proportional exchange between London and Madrid ?

*Equation.*

$$\begin{aligned}
 &1 \text{ dollar} = x \\
 &4 \text{ dollars} = 1 \text{ pistole} \\
 &1 \text{ pistole} = 2300 \text{ reis} \\
 &1000 \text{ reis} = 62 \text{ pence.}
 \end{aligned}$$

*Rule.*—Multiply the course of exchange between Madrid and Lisbon by the course of London on Lisbon ; and divide the product by 4000, fixed number.

$$\begin{array}{r}
 2300 \\
 62 \\
 \hline
 4600 \\
 13800 \\
 \hline
 142600
 \end{array}
 \qquad
 \begin{array}{r}
 4000)142600(35\frac{2}{3} \text{ result} \\
 \underline{22600} \\
 2600
 \end{array}$$

## LONDON AND MADRID

*Through PARIS.*

A bill on Paris taken in London at 25 livres 5 sols tournois per pound sterling is remitted to Madrid, and negotiated at 15 livres 6 sols tournois per pistole of exchange : what is the proportional exchange between London and Madrid ?

*Equation.*

$$\begin{aligned}
 &1 \text{ dollar} = x \\
 &4 \text{ dollars} = 1 \text{ pistole} \\
 &1 \text{ pistole} = 15\frac{3}{10} \text{ livres tournois} \\
 &25\frac{1}{4} \text{ livres tournois} = 1 \text{ pound sterling} \\
 &1 \text{ pound sterling} = 240 \text{ pence sterling.}
 \end{aligned}$$

*Rule.*—Multiply 60, fixed number, by the course of exchange between Madrid and Paris ; and divide the product by the course of London on Paris.

$$\begin{array}{r}
 25\frac{1}{4} \\
 4 \text{ fraction} \\
 \hline
 101 \text{ divisor}
 \end{array}
 \qquad
 \begin{array}{r}
 60 \\
 15\frac{3}{10} \\
 \hline
 900 \\
 18 \\
 \hline
 918 \\
 4 \text{ fraction} \\
 \hline
 101)3672(36\frac{1}{3} \text{ result.} \\
 \underline{642} \\
 36
 \end{array}$$



*Recapitulation of the Proportional Exchange between LONDON and MADRID.*

|                                                                    |                                |
|--------------------------------------------------------------------|--------------------------------|
| Through Amsterdam it comes out, and <i>will answer to remit</i> .. | 34 $\frac{1}{4}$               |
| Genoa .....                                                        | 35 $\frac{2}{3}$ $\frac{1}{4}$ |
| Hamburg .....                                                      | 34 $\frac{1}{4}$               |
| Leghorn <i>will answer to draw</i> .....                           | 36 $\frac{1}{4}$               |
| Lisbon .....                                                       | 35 $\frac{2}{3}$               |
| Paris .....                                                        | 36 $\frac{1}{4}$               |
| <i>Direct course between London and Madrid</i> .....               | 35 $\frac{1}{2}$               |

*Application to Remit.*

It appears by the comparison of the above mentioned exchanges, that the proportional exchange upon Amsterdam is the lowest, and, consequently, that it would be more advantageous to remit to Madrid by that place than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 34 $\frac{1}{4}$ , instead of the direct, 35 $\frac{1}{2}$ ; so that a merchant would give only 34 $\frac{1}{4}$  pence sterling in exchange for one dollar of exchange.

|                                                                             |       |    |   |
|-----------------------------------------------------------------------------|-------|----|---|
| 35 $\frac{1}{2}$ direct course : 34 $\frac{1}{4}$ indirect course :: £100 : | 96    | 9  | 7 |
| Add for charges, at $\frac{3}{4}$ per cent .....                            | 0     | 15 | 0 |
| Advantage resulting from the arbitration                                    | 2     | 15 | 5 |
|                                                                             | <hr/> |    |   |
|                                                                             | 100   | 0  | 0 |

*Application to Draw.*

If a merchant at London had to value on Madrid, instead of drawing directly, he would order his correspondent at Madrid to take a bill on Leghorn at 136, and either to remit it thither to provide for drafts from London upon Leghorn at 50, or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 36 $\frac{1}{4}$ , instead of the direct, 35 $\frac{1}{2}$ ; so that a merchant would receive 36 $\frac{3}{4}$  pence for a dollar.

|                                                                             |       |    |   |
|-----------------------------------------------------------------------------|-------|----|---|
| 35 $\frac{1}{2}$ direct course : 36 $\frac{1}{4}$ indirect course :: £100 : | 103   | 10 | 5 |
| Less for charges, at $\frac{3}{4}$ per cent .....                           | 0     | 15 | 0 |
| Advantage resulting from the arbitration                                    | 2     | 15 | 5 |
|                                                                             | <hr/> |    |   |
|                                                                             | 100   | 0  | 0 |



## LONDON AND PARIS.

*Proportional Exchange.*

|                 | Quotation at London. | Quotation from Paris. |
|-----------------|----------------------|-----------------------|
| On Paris.....   | 25 8                 |                       |
| Amsterdam ..... | 37 5                 | 54 $\frac{1}{8}$      |
| Genoa.....      | 45                   | 93 $\frac{1}{4}$      |
| Hamburg.....    | 35 6                 | 197                   |
| Leghorn.....    | 48 $\frac{1}{2}$     | 101                   |
| Lisbon.....     | 61                   | 480                   |
| Madrid.....     | 35 $\frac{1}{2}$     | 14 12 6               |

*Observation.*

London gives the certain price to Paris, that is, one pound sterling for so many livres tournois, more or less; therefore, when London remits to Paris, that place through which the highest course of exchange can be obtained is to be preferred, because more livres tournois will be received in exchange for one pound sterling. On the contrary, when London has to draw upon Paris, that place should be chosen which furnishes the lowest course, because less livres tournois will be given in exchange for a pound sterling.

If you include the charges in the equation, insert, for an indirect remittance, 100 in the divisor, and 100 less the charges in the dividend; and, for an indirect draft, place 100 in the divisor, and 100 more the charges in the dividend.

N. B. The above quotations are successively combined in the following arbitrations, to ascertain the advantage which may be derived from the comparison of the different proportional exchanges.



## LONDON AND PARIS

*Through AMSTERDAM.*

A bill on Amsterdam taken in London at 37 shillings 5 grotes Flemish banco per pound sterling is remitted to Paris, and negotiated at  $54\frac{1}{8}$  grotes for 3 francs: what is the proportional exchange between London and Paris?

*Equation.*

$$\begin{aligned} 1 \text{ pound sterling} &= x \\ 1 \text{ pound sterling} &= 37\frac{5}{8} \text{ shillings Flemish} \\ 1 \text{ shilling Flemish} &= 12 \text{ grotes} \\ 54\frac{1}{8} \text{ grotes} &= 3 \text{ francs} \\ 80 \text{ francs} &= 81 \text{ livres tournois.} \end{aligned}$$

*Rule.*—Multiply 729, fixed number, by the course of exchange between London and Amsterdam; and divide the product by 20, fixed number, multiplied by the course of Paris on Amsterdam.

|                    |                     |                                          |
|--------------------|---------------------|------------------------------------------|
| 20                 | 729                 | 2165)54553 $\frac{1}{8}$ (25 3 11 result |
| 54 $\frac{1}{8}$   | 37 5                | 11253                                    |
| <hr/>              | <hr/>               | 428                                      |
| 1080               | 5103                | 20                                       |
| 2 $\frac{1}{2}$    | 2187                | <hr/>                                    |
| <hr/>              | 303 $\frac{3}{4}$   | 8570                                     |
| 1082 $\frac{1}{2}$ | <hr/>               | 2075                                     |
| 2 fraction         | 27276 $\frac{3}{4}$ | 12                                       |
| <hr/>              | 2 fraction          | <hr/>                                    |
| 2165 divisor       | <hr/>               | 24900                                    |
|                    | 54553 $\frac{1}{8}$ | 3250                                     |
|                    |                     | 1085                                     |

## LONDON AND PARIS

*Through GENOA.*

A bill on Genoa taken in London at 45 pence sterling per pezza of 5 $\frac{3}{4}$  lire fuori di banco is remitted to Paris, and negotiated at 93 $\frac{1}{4}$  sols in francs per pezza fuori di banco: what is the proportional exchange between London and Paris?

*Equation.*

$$\begin{aligned} 1 \text{ pound sterling} &= x \\ 1 \text{ pound sterling} &= 240 \text{ pence} \\ 45 \text{ pence} &= 1 \text{ pezza} \\ 1 \text{ pezza} &= 93\frac{1}{4} \text{ sols} \\ 20 \text{ sols} &= 1 \text{ franc} \\ 80 \text{ francs} &= 81 \text{ livres tournois.} \end{aligned}$$

*Rule.*—Multiply 243, fixed number, by the course of exchange between Paris and Genoa; and divide the product by 20, fixed number, multiplied by the course of London on Genoa.

|             |                     |                                        |
|-------------|---------------------|----------------------------------------|
| 20          | 243                 | 900)22659 $\frac{3}{4}$ (25 3 6 result |
| 45          | 93 $\frac{1}{4}$    | 4659                                   |
| <hr/>       | <hr/>               | 159                                    |
| 900 divisor | 729                 | 20                                     |
|             | 2187                | <hr/>                                  |
|             | 60 $\frac{3}{4}$    | 3195                                   |
|             | <hr/>               | 495                                    |
|             | 22659 $\frac{3}{4}$ | 12                                     |
|             |                     | <hr/>                                  |
|             |                     | 5940                                   |
|             |                     | 540                                    |



## LONDON AND PARIS

*Through HAMBURG.*

A bill on Hamburg taken in London at 35 shillings 6 grotes Flemish banco per pound sterling is remitted to Paris, and negotiated at 197 livres tournois for 100 marcs lubs banco: what is the proportional exchange between London and Paris?

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 35\frac{1}{2} \text{ shillings Flemish} \\
 8 \text{ shillings Flemish} & = & 3 \text{ marcs} \\
 100 \text{ marcs banco} & = & 197 \text{ livres tournois.}
 \end{array}$$

*Rule.*—Multiply 3, fixed number, by the course of exchange between London and Hamburg, and by the course of Paris on Hamburg; divide the product by 800, fixed number.

|                     |                                        |
|---------------------|----------------------------------------|
| 3                   | 800)20980 $\frac{1}{2}$ (26 4 6 result |
| 35 $\frac{1}{2}$    | 4980                                   |
| 106 $\frac{1}{2}$   | 180                                    |
| 197                 | 20                                     |
| 742                 | 3610                                   |
| 954                 | 410                                    |
| 106                 | 12                                     |
| 98 $\frac{1}{2}$    | 4920                                   |
| 20980 $\frac{1}{2}$ | 120                                    |

## LONDON AND PARIS

*Through LEGHORN.*

A bill on Leghorn taken in London at 48 $\frac{1}{2}$  pence sterling per pezza of 8 reals is remitted to Paris, and negotiated at 101 sols in francs per pezza of 8 reals: what is the proportional exchange between London and Paris?

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence} \\
 48\frac{1}{2} \text{ pence} & = & 1 \text{ pezza} \\
 1 \text{ pezza} & = & 101 \text{ sols} \\
 20 \text{ sols} & = & 1 \text{ franc} \\
 80 \text{ francs} & = & 81 \text{ livres tournois.}
 \end{array}$$

*Rule.*—Multiply 243, fixed number, by the course of exchange between Paris and Leghorn; and divide the product by 20, fixed number, multiplied by the course of London on Leghorn.

|                  |       |                       |
|------------------|-------|-----------------------|
| 20               | 243   | 970)24543(25 6 result |
| 48 $\frac{1}{2}$ | 101   | 5143                  |
| 960              | 243   | 293                   |
| 10               | 2430  | 20                    |
| 970 div.         | 24543 | 5860                  |
|                  |       | 40                    |
|                  |       | 12                    |
|                  |       | 480                   |



## LONDON AND PARIS

*Through LISBON.*

A bill on Lisbon taken in London at 61 pence sterling per mil-reis is remitted to Paris, and negotiated at 480 reis for 3 francs: what is the proportional exchange between London and Paris?

*Equation.*1 pound sterling =  $x$ 

1 pound sterling = 240 pence

61 pence = 1000 reis

480 reis = 3 francs

80 francs = 81 livres tournois.

*Rule.*—Divide 729000, fixed number, by the course of exchange between Paris and Lisbon multiplied by the course of London on Lisbon.

|            |                              |
|------------|------------------------------|
| 480        | 29280)729000(24 17 11 result |
| 61         | 143400                       |
| —          | 26280                        |
| 480        | 20                           |
| 2880       | —                            |
| —          | 525600                       |
| 29280 div. | 232800                       |
|            | 27840                        |
|            | 12                           |
|            | —                            |
|            | 55680                        |
|            | 27840                        |
|            | —                            |
|            | 334080                       |
|            | 41280                        |
|            | —                            |
|            | 12000                        |

## LONDON AND PARIS

*Through MADRID.*

A bill on Madrid taken in London at  $35\frac{1}{2}$  pence sterling per dollar of exchange is remitted to Paris, and negotiated at 14 livres 12 sols 6 deniers tournois per pistole of exchange: what is the proportional exchange between London and Paris?

*Equation.*1 pound sterling =  $x$ 

1 pound sterling = 240 pence

 $35\frac{1}{2}$  pence = 1 dollar

4 dollars = 1 pistole

1 pistole =  $14\frac{1}{2}$  livres tournois.

*Rule.*—Multiply 60, fixed number, by the course of exchange between Paris and Madrid; and divide the product by the course of London on Madrid.

|                 |                  |                        |
|-----------------|------------------|------------------------|
| $35\frac{1}{2}$ | 60               | 71)1755(24 14 4 result |
| 2 fraction      | $14\frac{5}{8}$  | 335                    |
| —               | —                | 51                     |
| 71 divisor      | 840              | 20                     |
|                 | $37\frac{1}{2}$  | —                      |
|                 | —                | 1020                   |
|                 | $877\frac{1}{2}$ | 310                    |
|                 | 2 fraction       | 26                     |
|                 | —                | 12                     |
|                 | 1755             | —                      |
|                 |                  | 312                    |
|                 |                  | 28                     |



*Recapitulation of the Proportional Exchange between LONDON and PARIS.*

|                                                     |    |    |    |
|-----------------------------------------------------|----|----|----|
| Through Amsterdam it comes out at .....             | 25 | 3  | 11 |
| Genoa .....                                         | 25 | 3  | 6  |
| Hamburg <i>will answer to remit</i> .....           | 26 | 4  | 6  |
| Leghorn .....                                       | 25 | 6  | 0  |
| Lisbon .....                                        | 24 | 17 | 11 |
| Madrid <i>will answer to draw</i> .....             | 24 | 14 | 4  |
| <i>Direct course between London and Paris</i> ..... | 25 | 8  | 0  |

*Application to Remit.*

It appears by the comparison of the abovementioned exchanges, that the proportional exchange upon Hamburg is the highest, and, consequently, that it would be more advantageous to remit to Paris by that place than by either of the others, or by a direct bill. Such remittance would establish an indirect course of 26 4 6, instead of the direct, 25 8; so that a merchant would receive 26 livres 4 sols 6 deniers tournois in exchange for one pound sterling.

|                                                       |       |    |    |
|-------------------------------------------------------|-------|----|----|
| 25 8 direct course : 26 4 6 indirect course :: £100 : | 103   | 4  | 11 |
| Less for charges, at $\frac{3}{4}$ per cent .....     | 0     | 15 | 0  |
| Advantage resulting from the arbitration ..           | 2     | 9  | 11 |
|                                                       | <hr/> |    |    |
|                                                       | 100   | 0  | 0  |

*Application to Draw.*

If a merchant at London had to value on Paris, instead of drawing directly, he would order his correspondent at Paris to take a bill on Madrid at 14 12 6, and either to remit it thither to provide for drafts from London on Madrid at  $35\frac{1}{2}$ , or to remit it to London to be negotiated at the same price. Such operation would establish an indirect course of 24 14 4, instead of the direct, 25 8; so that a merchant would give only 24 livres 14 sols 4 deniers tournois in exchange for one pound sterling.

|                                                        |       |    |    |
|--------------------------------------------------------|-------|----|----|
| 25 8 direct course : 24 14 4 indirect course :: £100 : | 97    | 6  | 2  |
| Add for charges, at $\frac{3}{4}$ per cent .....       | 0     | 15 | 0  |
| Advantage resulting from the arbitration ..            | 1     | 18 | 10 |
|                                                        | <hr/> |    |    |
|                                                        | 100   | 0  | 0  |



CALCULATION OF ARBITRATIONS OF EXCHANGE  
BY LOGARITHMS.

THE arbitrations which I have just exemplified are those of particular reference to London, and I shall dispense with giving instances adapted to other places which are not now of great importance in exchange operations. It may be observed, however, that, notwithstanding such limitation of the work to the most essential arbitrations, the general rules which I have developed, and the line which I have traced, will afford sufficient means for the solution of every similar case; and it cannot fail of occurring, to those who know the susceptibility of this branch of calculations to combinations almost infinite, that it would be absolutely impossible, even in an extensive treatise, to point out all the cases which are feasible.

It will have been observed, by the preceding arbitrations, that the only variable numbers in the statement of the questions are those of the two courses of exchange; whence, in order to simplify the calculations, I have given the fixed numbers resulting from the suppression, multiplication, or division of the invariable numbers in each equation.

Arbitrations are, nevertheless, susceptible of greater simplification by the use of logarithms.

It is not my intention, at this moment, to speak of the nature and properties of logarithms, being a subject of which I have treated in the observations preceding the table with which I have closed my work; but, in order that the reader may judge with precision of the application of logarithms to arbitrations of exchange, and of the means which they afford of simplifying them, I shall proceed to perform, by logarithms, the same operations which I have already effected by the common rules of arithmetic, whence it will be easy to compare the two methods.

In the application of logarithms to any arbitration by three places, only three logarithms are employed; that is, the logarithms of each of the two courses of exchange which are the only variable numbers in the same arbitrations, and a fixed logarithm. To find the fixed logarithm of every equation, we add the logarithms corresponding to the invariable numbers in the respective columns of the divisor and of the dividend, and subtract the smaller sum



from the greater. The remainder is the fixed logarithm to be employed with the logarithms of the two courses of exchange.

One of the advantages of this method by logarithms is, that, in every operation, there is only one fixed logarithm, while, by the arithmetical method, we have seen, that, in certain arbitrations, there has been necessarily a fixed number in the divisor and another fixed number in the dividend; at least as often as the greater fixed number could not be divided by the smaller without leaving any remainder. The same advantage of logarithms will be still more apparent hereafter, when I shall apply them to the calculations of bullion and specie, and to those of merchandize.

The method by logarithms is so very simple, that an example or two will suffice to illustrate the following operations.

*First Example.*

Turning to page 159, where an arbitration is stated between London and Lisbon through Amsterdam, I perceive that 50 is the fixed number resulting from the division of the invariable numbers which are a part of the same arbitration; that is, of  $\frac{1000 \times 240}{400 \times 12}$ ; and that it is necessary to multiply 50 by  $46\frac{1}{2}$ , being the course of exchange between Lisbon and Amsterdam, and then to divide the product by 36 10, or the course of exchange between London and Amsterdam.

|                                                                                                                              |                                         |        |
|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------|
| In order to perform the operation by logarithms, I look in the table for the logarithm corresponding to the fixed number 50, | which gives, as a fixed logarithm ..... | 169897 |
| I add the logarithm of $46\frac{1}{2}$ .....                                                                                 |                                         | 166745 |
|                                                                                                                              |                                         | <hr/>  |
| and from the sum of the two logarithms .....                                                                                 |                                         | 336642 |
| I deduct the logarithm of 36 10 .....                                                                                        |                                         | 156624 |
|                                                                                                                              |                                         | <hr/>  |
| which leaves a remainder of .....                                                                                            |                                         | 180018 |

Referring to the table for the arithmetical number corresponding to the logarithm 180018, I find  $63\frac{2}{16}$ , being the proportional exchange required between London and Lisbon, and which is, in fact, the same result as that which I had obtained by the arithmetical operation.

It will be observed, that if, from the sum of the two logarithms corresponding with the invariable numbers 1000 and 240 in the dividend, I had deducted the sum of the two logarithms corre-



sponding to the invariable numbers 400 and 12 in the divisor, I should have obtained the same fixed logarithm, in the following manner :

|                                   |   |        |
|-----------------------------------|---|--------|
| Logarithm of 1000.....            | = | 300000 |
| of 240.....                       | + | 238021 |
|                                   |   | <hr/>  |
|                                   |   | 538021 |
| Logarithm of ..... 400 = 260206 } |   |        |
| of ..... 12 + 107918 }            | — | 368124 |
|                                   |   | <hr/>  |
| Fixed logarithm .....             |   | 169897 |

### *Second Example.*

In the arbitration between London and Madrid by Amsterdam (page 164), I perceive, that, according to the given rule, it is requisite to multiply 1088, fixed number, by  $88\frac{1}{2}$ , being the course of exchange between Madrid and Amsterdam, and to divide the product by 75, fixed number, and by 37 6, being the course of exchange between London and Amsterdam.

To effect the operation by logarithms, I deduct, in the first instance, 187506, the logarithm of the fixed number 75, from 303663, the logarithm of the fixed number 1088, which leaves, as a fixed logarithm .....

116157  
I add the logarithm of  $88\frac{1}{2}$  .....

194694

---

310851

and deducting the logarithm of 37 6 .....

157403

---

153448

I find in the table that  $34\frac{6}{24}$  is the number which approaches the nearest to the logarithm 153448, which proves to be the same result as that of the operation by the rules of arithmetic.

We have seen, that the principal units of monies of different countries are subdivided in great variety. It would, therefore, be difficult to compose tables of logarithms to correspond with all such divisions; not to mention how much the tables would thereby be rendered long and diffuse: thus, in the last arbitration, we shall not find a logarithm corresponding with the number 14 12 6, or the course of exchange of Paris on Madrid, since, in that part of the table, the units are divided into twentieths. We may obtain, however, an exact logarithm by the following method :



The logarithm of 14 13 is ..... 116585  
 And the logarithm of 14 12 is ..... 116435

Difference ..... 150

The logarithm of 14 12½ will consequently be 116435, or the logarithm of 14 12 plus half of the difference 150, or 75; that is to say, it will be 116510. It is obvious, that, if the course of exchange of Paris upon Madrid had been 14 12 3, we should have added to 116435 only the fourth of the difference.

I have demonstrated this example, in order that the reader may prove the logarithm of which I have made use in that arbitration; and I shall observe, that the same method is to be adopted whenever the exchange of Paris on Madrid, and of Paris on London, or *vice versâ*, may include a fraction of deniers tournois.

In respect to the results of the several arbitrations, as a rigid exactness is not necessary in practice, it will only be requisite to take the number, or fractional number, which may be the nearest to the logarithm found.

I trust that what has been said will suffice for the understanding of the principle of the arbitrations which follow, and which are merely a repetition of those already exemplified. The fixed logarithms being denoted in each operation, it will be only requisite to substitute the logarithms of the actual courses of exchange, paying attention to the signs (+ and —) of addition and subtraction.



## LONDON AND AMSTERDAM

Through GENOA.

|                     |                  |   |        |                            |
|---------------------|------------------|---|--------|----------------------------|
| Fixed number.....   | 20               | = | 130103 | fixed logarithm            |
| Amsterdam on Genoa  | 83 $\frac{1}{2}$ | + | 192169 |                            |
|                     |                  |   | <hr/>  |                            |
|                     |                  |   | 322272 |                            |
| London on Genoa.... | 45               | — | 165321 |                            |
|                     |                  |   | <hr/>  |                            |
|                     |                  |   | 156951 | = 37 $1\frac{1}{3}$ result |

## HAMBURG.

|                      |    |   |        |                            |
|----------------------|----|---|--------|----------------------------|
| London on Hamburg    | 35 | = | 154407 |                            |
| Amsterdam on ditto.. | 34 | + | 153148 |                            |
|                      |    |   | <hr/>  |                            |
|                      |    |   | 307555 |                            |
| Fixed number .....   | 32 | — | 150515 | fixed logarithm            |
|                      |    |   | <hr/>  |                            |
|                      |    |   | 157040 | = 37 $2\frac{1}{4}$ result |

## LEGHORN.

|                      |                  |   |        |                            |
|----------------------|------------------|---|--------|----------------------------|
| Fixed number .....   | 20               | = | 130103 | fixed logarithm            |
| Amsterdam on Leghorn | 90               | + | 195424 |                            |
|                      |                  |   | <hr/>  |                            |
|                      |                  |   | 325527 |                            |
| London on Leghorn..  | 48 $\frac{1}{2}$ | — | 168574 |                            |
|                      |                  |   | <hr/>  |                            |
|                      |                  |   | 156953 | = 37 $1\frac{1}{3}$ result |

## LISBON.

|                     |                  |   |        |                             |
|---------------------|------------------|---|--------|-----------------------------|
| Fixed number .....  | 50               | = | 169897 | fixed logarithm             |
| Amsterdam on Lisbon | 44 $\frac{1}{2}$ | + | 164836 |                             |
|                     |                  |   | <hr/>  |                             |
|                     |                  |   | 334733 |                             |
| London on Lisbon .. | 62               | — | 179239 |                             |
|                     |                  |   | <hr/>  |                             |
|                     |                  |   | 155494 | = 35 $10\frac{2}{3}$ result |

## MADRID.

|                                     |        |                                    |
|-------------------------------------|--------|------------------------------------|
| Instead of the two fixed numbers    | 116157 | fixed logarithm                    |
| Amsterdam on Madrid $88\frac{1}{4}$ | +      | 194571                             |
|                                     |        | <hr/>                              |
|                                     |        | 310728                             |
| London on Madrid .. $34\frac{1}{2}$ | —      | 153782                             |
|                                     |        | <hr/>                              |
|                                     |        | 156946 = 37 $1\frac{5}{16}$ result |

## PARIS.

|                                |                  |   |        |                            |
|--------------------------------|------------------|---|--------|----------------------------|
| London on Paris.....           | 25 15            | = | 141078 |                            |
| Amsterdam on Paris...          | 53 $\frac{1}{2}$ | + | 172835 |                            |
|                                |                  |   | <hr/>  |                            |
|                                |                  |   | 313913 |                            |
| Instead of the two fixed numb. |                  | — | 156170 | fixed logarithm            |
|                                |                  |   | <hr/>  |                            |
|                                |                  |   | 157743 | = 37 $9\frac{1}{2}$ result |



## LONDON AND GENOA

Through AMSTERDAM.

Fixed number..... 20 = 130103 fixed logarithm  
 Genoa on Amsterdam  $84\frac{7}{8}$  + 192878

322981

London on Amsterdam 37 4 — 157210

165771 =  $45\frac{1}{2}$  result

## HAMBURG.

Fixed number..... 73600 = 486688 fixed logarithm  
 London on Hamburg .. 35 4 — 154819

331869

Genoa on Hamburg ..  $46\frac{1}{4}$  — 166511

165358 = 45 result

## LEGHORN.

Fixed number..... 115 = 206070 fixed logarithm  
 London on Leghorn.. 50 + 169897

375967

Genoa on Leghorn ..  $124\frac{1}{2}$  — 209517

166450 =  $46\frac{3}{16}$  result

## LISBON.

Genoa on Lisbon .... 765 = 288366  
 London on Lisbon ..  $61\frac{1}{2}$  + 178888

467254

Fixed number ..... 1000 — 300000

167254 =  $47\frac{1}{21}$  result

## MADRID.

Genoa on Madrid .. 660 = 281954  
 London on Madrid ..  $34\frac{3}{4}$  + 154095

436049

Instead of the two fixed numb.— 270428 fixed logarithm

165621 =  $45\frac{5}{16}$  result

## PARIS.

Instead of the two fixed numbers 108458 fixed logarithm  
 Genoa on Paris ....  $94\frac{7}{8}$  + 197715

306173

London on Paris .... 25 2 — 139967

166206 =  $45\frac{1}{6}$  result



## LONDON AND HAMBURG

Through AMSTERDAM.

|                     |                  |   |               |                             |
|---------------------|------------------|---|---------------|-----------------------------|
| Fixed number .....  | 32               | = | 150515        | fixed logarithm             |
| London on Amsterdam | 37 3             | + | 157113        |                             |
|                     |                  |   | <u>307628</u> |                             |
| Hamburg on Amsterd. | 34 $\frac{1}{4}$ | — | 153466        |                             |
|                     |                  |   | <u>154162</u> | = 34 9 $\frac{2}{3}$ result |

## GENOA.

|                     |    |   |               |                 |
|---------------------|----|---|---------------|-----------------|
| Fixed number .....  | 20 | = | 130103        | fixed logarithm |
| Hamburg on Genoa... | 78 | + | 189209        |                 |
|                     |    |   | <u>319312</u> |                 |
| London on Genoa.... | 45 | — | 165321        |                 |
|                     |    |   | <u>153991</u> | = 34 8 result   |

## LEGHORN.

|                     |                  |   |               |                             |
|---------------------|------------------|---|---------------|-----------------------------|
| Fixed number .....  | 20               | = | 130103        | fixed logarithm             |
| Hamburg on Leghorn  | 85 $\frac{1}{4}$ | + | 193323        |                             |
|                     |                  |   | <u>323426</u> |                             |
| London on Leghorn.. | 48 $\frac{1}{4}$ | — | 168350        |                             |
|                     |                  |   | <u>155076</u> | = 35 6 $\frac{1}{2}$ result |

## LISBON.

|                      |                  |   |               |                             |
|----------------------|------------------|---|---------------|-----------------------------|
| Fixed number .....   | 50               | = | 169897        | fixed logarithm             |
| Hamburg on Lisbon..  | 41 $\frac{3}{4}$ | + | 162066        |                             |
|                      |                  |   | <u>331963</u> |                             |
| London on Lisbon.... | 61 $\frac{3}{4}$ | — | 179064        |                             |
|                      |                  |   | <u>152899</u> | = 33 9 $\frac{2}{3}$ result |

## MADRID.

|                                  |                  |                 |               |                             |
|----------------------------------|------------------|-----------------|---------------|-----------------------------|
| Instead of the two fixed numbers | 116157           | fixed logarithm |               |                             |
| Hamburg on Madrid                | 82 $\frac{1}{2}$ | +               | 191645        |                             |
|                                  |                  |                 | <u>307802</u> |                             |
| London on Madrid ..              | 34 $\frac{1}{2}$ | —               | 153782        |                             |
|                                  |                  |                 | <u>154020</u> | = 34 8 $\frac{1}{4}$ result |

## PARIS.

|                                |                  |        |                 |                             |
|--------------------------------|------------------|--------|-----------------|-----------------------------|
| London on Paris ....           | 25 10            | =      | 140654          |                             |
| Hamburg on Paris ..            | 24 $\frac{7}{8}$ | +      | 139576          |                             |
|                                |                  |        | <u>280230</u>   |                             |
| Instead of the two fixed numb. | —                | 126067 | fixed logarithm |                             |
|                                |                  |        | <u>154163</u>   | = 34 9 $\frac{2}{3}$ result |



## LONDON AND LEGHORN

Through AMSTERDAM.

Fixed number..... 20 = 130103 fixed logarithm  
 Leghorn on Amsterdam 92 + 196379

London on Amsterdam 37 2 — 326482  
 157015

169467 =  $49\frac{1}{2}$  result

## GENOA.

Leghorn on Genoa... 124 = 209342  
 London on Genoa... 45 $\frac{1}{4}$  + 166039

Fixed number..... 115 — 375381  
 206070 fixed logarithm

169311 =  $49\frac{1}{3}$  result

## HAMBURG.

Fixed number..... 20 = 130103 fixed logarithm  
 Leghorn on Hamburg... 86 $\frac{1}{4}$  + 193576

London on Hamburg 35 1 — 323679  
 154510

169169 =  $49\frac{1}{8}$  result

## LISBON.

Leghorn on Lisbon... 830 = 291908  
 London on Lisbon.... 61 $\frac{1}{2}$  + 178888

Fixed number..... 1000 — 470796  
 300000 fixed logarithm

170796 =  $51\frac{1}{22}$  result

## MADRID.

Leghorn on Madrid... 142 = 215229  
 London on Madrid... 35 + 154407

Fixed number..... 100 — 369636  
 200000 fixed logarithm

169636 =  $49\frac{11}{16}$  result

## PARIS.

Instead of the two fixed numbers 108458 fixed logarithm  
 Leghorn on Paris.... 104 + 201703

London on Paris..... 24 15 — 310161  
 139358

170803 =  $51\frac{1}{16}$  result.



## LONDON AND LISBON

Through AMSTERDAM.

|                     |       |   |        |                 |
|---------------------|-------|---|--------|-----------------|
| Fixed number.....   | 50    | = | 169897 | fixed logarithm |
| Lisbon on Amsterdam | 46½   | + | 166745 |                 |
|                     |       |   | <hr/>  |                 |
|                     |       |   | 336642 |                 |
| London on Amsterdam | 36 10 | — | 156624 |                 |
|                     |       |   | <hr/>  |                 |
|                     |       |   | 180018 | = 63½ result    |

## GENOA.

|                    |      |   |        |                 |
|--------------------|------|---|--------|-----------------|
| Fixed number.....  | 1000 | = | 300000 | fixed logarithm |
| London on Genoa... | 45½  | + | 165801 |                 |
|                    |      |   | <hr/>  |                 |
|                    |      |   | 465801 |                 |
| Lisbon on Genoa... | 730  | — | 286332 |                 |
|                    |      |   | <hr/>  |                 |
|                    |      |   | 179469 | = 62½ result    |

## HAMBURG.

|                   |       |   |        |                 |
|-------------------|-------|---|--------|-----------------|
| Fixed number..... | 50    | = | 169897 | fixed logarithm |
| Lisbon on Hamburg | 44    | + | 164345 |                 |
|                   |       |   | <hr/>  |                 |
|                   |       |   | 334242 |                 |
| London on Hamburg | 34 10 | — | 154200 |                 |
|                   |       |   | <hr/>  |                 |
|                   |       |   | 180042 | = 63½ result    |

## LEGHORN.

|                     |      |   |        |                 |
|---------------------|------|---|--------|-----------------|
| Fixed number.....   | 1000 | = | 300000 | fixed logarithm |
| London on Leghorn.. | 49   | + | 169020 |                 |
|                     |      |   | <hr/>  |                 |
|                     |      |   | 469020 |                 |
| Lisbon on Leghorn.. | 830  | — | 291903 |                 |
|                     |      |   | <hr/>  |                 |
|                     |      |   | 177112 | = 59½ result    |

## MADRID.

|                    |      |   |        |                 |
|--------------------|------|---|--------|-----------------|
| Fixed number.....  | 4000 | = | 360206 | fixed logarithm |
| London on Madrid.. | 34½  | + | 153782 |                 |
|                    |      |   | <hr/>  |                 |
|                    |      |   | 513988 |                 |
| Lisbon on Madrid.. | 2250 | — | 335218 |                 |
|                    |      |   | <hr/>  |                 |
|                    |      |   | 178770 | = 61½ result    |

## PARIS.

|                      |        |   |        |                 |
|----------------------|--------|---|--------|-----------------|
| Fixed number.....    | 729000 | = | 586273 | fixed logarithm |
| Lisbon on Paris ..   | 460    | — | 266276 |                 |
|                      |        |   | <hr/>  |                 |
|                      |        |   | 319997 |                 |
| London on Paris..... | 24 18  | — | 139620 |                 |
|                      |        |   | <hr/>  |                 |
|                      |        |   | 180377 | = 63¾ result    |



## LONDON AND MADRID

*Through* AMSTERDAM.

Instead of the two fixed numbers 116157 fixed logarithm  
 Madrid on Amsterdam  $88\frac{1}{2}$  + 194694

310851  
 London on Amsterdam 37 6 — 157403

153448 =  $34\frac{1}{4}$  result

## GENOA.

Fixed number..... 100 = 200000 fixed logarithm

London on Genoa.....  $45\frac{1}{2}$  + 165801

365801  
 Madrid on Genoa.....  $126\frac{1}{2}$  — 210209

155592 =  $35\frac{3}{4}$  result

## HAMBURG.

Instead of the two fixed numbers 116157 fixed logarithm

Madrid on Hamburg.... 83 + 191908

308065  
 London on Hamburg.... 35 2 — 154613

153452 =  $34\frac{1}{4}$  result

## LEGHORN.

Fixed number..... 100 = 200000 fixed logarithm

London on Leghorn.... 50 + 169897

369897  
 Madrid on Leghorn.... 136 — 213354

156543 =  $36\frac{3}{4}$  result

## LISBON.

Madrid on Lisbon.... 2300 = 336173

London on Lisbon.... 62 + 179239

515412  
 Fixed number..... 4000 — 360206 fixed logarithm

155206 =  $35\frac{2}{3}$  result

## PARIS.

Fixed number..... 60 = 177815 fixed logarithm

Madrid on Paris..... 15 6 + 118469

296284  
 London on Paris..... 25 5 — 140226

156058 =  $36\frac{1}{3}$  result



## LONDON AND PARIS

*Through* AMSTERDAM.

Instead of the two fixed numbers 156170 fixed logarithm

London on Amsterdam 37 5 + 157307

---

313477Paris on Amsterdam.. 54 $\frac{1}{8}$  — 173340

---

140137 = 25 4 result

## GENOA.

Instead of the two fixed numbers 108458 fixed logarithm

Paris on Genoa..... 93 $\frac{1}{4}$  + 196965

---

305423

London on Genoa.... 45 — 165321

---

140102 = 25 3 6 result

## HAMBURG.

London on Hamburg.. 35 6 = 155023

Paris on Hamburg.... 197 + 229447

---

384470

Instead of the two fixed numb.—242597 fixed logarithm

---

141873 = 26 4 6 result

## LEGHORN.

Instead of the two fixed numbers 108458 fixed logarithm

Paris on Leghorn... 101 + 200432

---

308890London on Leghorn.. 48 $\frac{1}{2}$  — 168574

---

140316 = 25 6 result

## LISBON.

Fixed number.. 729000 = 586273 fixed logarithm

London on Lisbon 61 — 178533

---

407740

Paris on Lisbon.... 480 — 268124

---

139616 = 24 18 result

## MADRID.

Fixed number..... 60 = 177815 fixed logarithm

Paris on Madrid.... 14 12 6 + 116510

---

294325London on Madrid.. 35 $\frac{1}{2}$  — 155023

---

139302 = 24 14 4 result



## OF THE CHOICE OF BILLS

*In respect to their Dues being more or less remote.*

It is often of some consequence to merchants, who may have to remit or to draw, to know whether it be more eligible to purchase, or to sell, bills of which the dues may be at hand, than others at a longer term. The two following examples will serve to determine the method of choice.

*First Example, To remit.*

The exchange of London upon Paris is at 25 6 at 1 day's date, and it is at the same time at 25 14 at two usances: which paper should we take for a remittance to a correspondent with whom we have an interest account at 6 per cent per annum?

In taking paper at 1 day's date, London would be credited by the sum to be remitted to Paris 59 days sooner than it would be by taking paper at two usances. It is to be considered, therefore, whether the interest which would be allowed upon 25 livres 6 sols tournois, during 59 days, be of greater or less consequence than the difference between the two courses of exchange, and which, in the present instance, is 8 sols. Observing, also, that the commercial year in France consists of 360 days, we have to follow the rule given under the head of Interest, page 12, by assuming the fixed number 6000 as a divisor, and calculating according to the following proportion:

$$6000 : 59 \text{ days} :: 506 \text{ sols} : x.$$

Hence it is evident, that, if we were to take paper at 25 6 at 1 day's date, and add to such rate the result of the proportion just stated, which is 4 sols  $11\frac{2}{3}$  deniers, the remittance would be equivalent to other paper at 25 10  $11\frac{2}{3}$  at two usances; it is therefore more eligible to choose that at 25 14 at two usances, since we shall receive 3 sols  $\frac{1}{3}$  denier per pound sterling more than we should otherwise receive.

*Second Example, To draw.*

The exchange of London upon Paris is again taken at 25 6 at 1 day's date, and at 25 14 at two usances: at which of these courses should we draw, supposing that we have funds at Paris at interest at 6 per cent per annum?

By stating the same proportion as in the preceding example, we obtain the same result, which is also to be added to the rate of the exchange. It is therefore more eligible to draw at the exchange of 25 6 at 1 day's date, than at 25 14 at two usances; in-



asmuch as, by drawing at the former exchange, our correspondent will have to charge us, for every pound sterling which we shall receive, with only 25 6, and with the interest which will accrue upon the same sum of 25 6 during 59 days, which establishes an exchange between London and Paris of 25 10 11 $\frac{2}{3}$ , instead of 25 14.

## RULE,

*To find the Average Price of Exchange of several Bills taken at different Rates.*

It often happens that merchants purchasing bills at different prices upon the same place, wish to know the average price: for this purpose the following rule may be used.

Add respectively the sums which you have paid, and those which you are to receive in exchange; then state a rule of equation in which the first term of the dividend is always to be the certain price of the exchange, while the last term of the dividend is to be constantly of the same kind as the uncertain price.

## EXAMPLE.

London purchases upon Hamburg three bills of exchange, as undermentioned :

1342 3 at 35 9 $\frac{1}{2}$  ..... 100

2808 12 at 35 8 ..... 210

4914 1 at 35 5 ..... 370

---

9065 marcs banco cost 680 pounds sterling.

*Equation.*

1 pound sterling =  $x$

680 pounds sterling = 9065 marcs banco

3 marcs banco = 8 shillings Flemish.

The result of this equation denotes that the mean, or average, rate of exchange is 35 6 $\frac{1}{4}$ .

## RULE,

*To add, or to deduct, the Charges.*

First, consider what will be the nature of the result of the operation.

If the profit attending the result be greater in proportion as the result itself be more reduced, it is evident that the amount of the charges must be added.

If, on the contrary, the same result be more advantageous in proportion as it may be increased, it is obvious that the amount of the charges must be deducted.



## PROPOSITION.

By an arbitration between London and Hamburg, a proportional exchange has been obtained of 35 4, and the charges are estimated at  $\frac{3}{4}$  per cent: required to know the respective modes of adding and deducting such charges.

*Solution.*

To add the charges, I state the following proportion:

$$100 : 100\frac{3}{4} :: 35\ 4 : x.$$

To deduct the charges, I state another proportion:

$$100 : 99\frac{1}{4} :: 35\ 4 : x,$$

whence the following general rule:

To add the charges, multiply the result of the operation by 100 more the charges, and divide the product by 100.

To deduct the charges, multiply the result of the operation by 100 less the charges, and divide the product by 100.

## RULE,

*To place the Charges in the Equation.*

## PRINCIPLE.

If you include the charges in the equation, consider whether the result will be high or low.

If, to be advantageous, the result must be high, either deduct the charges from the dividend, or add them to the divisor.

If, to be profitable, the result must be low, either add the charges to the dividend, or deduct them from the divisor.

In fact, it is evident that, in the first instance, the result will be reduced, and, in the second, it will be increased.

## GENERAL RULE.

*To remit.*—If the first term of the dividend be of the same denomination as the money of the city which remits, place 100 in the divisor, and 100, less the charges, in the dividend; and, if otherwise, place 100, less the charges, in the divisor, and 100 in the dividend.

*To draw.*—If the first term of the dividend be of the same denomination as the money of the city which draws, place 100 in the divisor, and 100, with addition of the charges, in the dividend; if otherwise, place 100, with addition of the charges, in the divisor, and 100 in the dividend.

This rule is demonstrated by the following examples.



## RULE,

*To place the Charges in the Equation.*

## INDIRECT REMITTANCE.

*First Application.*

London takes a bill on Hamburg at 35 shillings 4 grotes Flemish banco per pound sterling, and remits it to Amsterdam to be negotiated at 34 stivers banco for 2 marcs banco: what course of exchange will that remittance establish between London and Amsterdam, 1 per cent being charged at Amsterdam for commission, brokerage, and postages?

*Equation.*

1 pound sterling = 37 shill. 2 grot.

1 pound sterling =  $35\frac{1}{3}$  shillings Flemish

8 shill. Flemish = 3 marcs banco

2 marcs banco = 34 stivers banco

6 stivers banco = 1 shilling Flemish

100

= 99 with charges.

As one pound sterling, first term of the dividend, is of the same denomination as the money of London, which remits, 100 must be placed in the divisor, and 100 less the charges, or 99, in the dividend.

In fact, London gives a pound sterling for  $35\frac{1}{3}$  shillings Flemish banco =  $13\frac{1}{4}$  marcs banco payable at Hamburg. Amsterdam, by the negotiation of 2 marcs banco, receives 34 stivers banco in exchange, and credits London by the amount, less 1 per cent for charges; therefore 100 less those charges, or 99, must be placed in the same column as the 34 stivers, to be opposed to 100 in the divisor.

## RULE,

*To place the Charges in the Equation.*

## INDIRECT REMITTANCE.

*Second Application.*

London takes a bill on Cadiz at 35 pence sterling per dollar of exchange, and remits it to Lisbon to be negotiated at 2280 reis per pistole of exchange: what course of exchange will that remittance establish between London and Lisbon, 1 per cent being charged at Lisbon for commission, brokerage, and postages?

*Equation.*

1000 reis = 62 pence

2280 reis = 1 pistole

1 pistole = 4 dollars

1 dollar = 35 pence

99 with charges = 100.



As 1000 reis, first term of the dividend, are not of the same denomination as the money of London, which remits, 100 less the charges, or 99, must be placed in the divisor, and 100 in the dividend.

In fact, London pays 35 pence sterling for 1 dollar of exchange to be received at Cadiz. Lisbon, by the negotiation of 1 pistole = 4 dollars, receives in exchange 2280 reis, and credits London by the amount, less 1 per cent for charges; therefore 1 per cent must be deducted in the column where 2280 reis stand.

### RULE,

*To place the Charges in the Equation.*

INDIRECT DRAFT.

*First Application.*

London draws upon Paris at 25 livres tournois per pound sterling, and directs it to reimburse itself on Hamburg at 192 livres tournois for 100 marcs banco, charging 1 per cent for commission, brokerage, and postages: what course of exchange will those prices establish between London and Hamburg?

*Equation.*

1 pound sterl. = 35 shill. 1 grot.

1 pound sterling = 25 livres tournois

192 livres tournois = 100 marcs banco

3 marcs banco = 8 shillings Flemish

100 with charges = 101.

As one pound sterling, first term of the dividend, is of the same denomination as the money of London, which draws, 100 must be placed in the divisor, and 100, with addition of 1 for charges, or 101, in the dividend.

In fact, Paris disburses 25 livres tournois for one pound sterling, received by London, and draws upon Hamburg at 192 livres for 100 marcs; but as 1 per cent is charged at Paris, it is necessary that Paris should draw 101 marcs instead of 100; therefore, 100 with addition of 1 must be placed in the same column as 100 marcs, to be opposed to 100 in the divisor.



## RULE,

*To place the Charges in the Equation.*

## INDIRECT DRAFT.

*Second Application.*

London draws upon Lisbon at 62 pence sterling for 1000 reis, and directs it to reimburse itself on Madrid at 2250 reis per pistole of exchange, charging 1 per cent for commission, brokerage, and postages: what course of exchange will those prices establish between London and Madrid?

*Equation.*

|             |      |                      |
|-------------|------|----------------------|
|             |      | 1 dollar = 34½ pence |
| 4 dollars = |      | 1 pistole            |
| 1 pistole = | 2250 | reis                 |
| 1000 reis = | 62   | pence                |
| 101         | =    | 100 with charges.    |

As 1 dollar, first term of the dividend, is not of the same denomination as the money of London, which draws, 100, with addition of 1 for charges, or 101, must be placed in the divisor, and 100 in the dividend.

In fact, Lisbon disburses 1000 reis for 62 pence sterling received by London, and draws upon Madrid at 2250 reis per pistole of exchange; but as 1 per cent is charged at Lisbon, it is necessary that Lisbon should draw for the equivalent of 1010 reis, instead of 1000; therefore 1 per cent must be added in the column where 1000 reis stand.

## RULE,

*To place the Charges in the Equation.*

## CONCLUSION.

It may be inferred from the preceding applications,

1st, That every place remitting indirectly a fixed and determinate sum in the money of the country where the operation ends, must remit to the intermediate place the equivalent of such sum, together with the charges.

2dly, That every place drawing indirectly a fixed and determinate sum in the money of the country where the ultimate draft is payable, must draw upon the intermediate place for the equivalent of such sum, less the charges.

These principles are demonstrated by the following examples.



## RULE,

*To place the Charges in the Equation.*

## INDIRECT REMITTANCE.

A merchant at London has occasion to remit 12000 livres tournois to Paris, but, as the medium of Hamburg offers an advantage, he remits to Hamburg at 35 shillings Flemish banco for one pound sterling, with orders to transmit the equivalent to Paris at 24 shillings banco for 3 francs, deducting 1 per 100 for charges at Hamburg: what sum does London disburse by such remittance?

*Equation.*

|                      |   |                      |
|----------------------|---|----------------------|
|                      |   | 12000 livres = 456 1 |
| 81 livres            | = | 80 francs            |
| 3 francs             | = | 24 shillings banco   |
| 6 shillings banco    | = | 1 shilling Flemish   |
| 35 shillings Flemish | = | 1 pound sterling     |
| 99 with charges      | = | 100.                 |

If Hamburg were to be paid by London for a sum of marcs equivalent with 12000 livres only, at the exchange of 24, it is evident there would be a deficit of the amount of the charges. London must, therefore, remit to Hamburg the value of 12000 livres, inclusive of the charges; while Hamburg, by remitting the exact sum of 12000 livres to Paris, will fulfil the order from London, and be itself repaid for the charges.

N. B. London might order Hamburg to remit the value of 12000 livres to Paris at 24, drawing upon London at 35 for the amount, inclusive of 1 per cent for the charges: in this case, the statement of the equation, and consequently the result, would be the same.

See the proof of this operation as under.

## RULE,

*To place the Charges in the Equation.*

## INDIRECT REMITTANCE.

*Proof of the preceding Operation.*

A merchant at London has occasion to remit 456 pounds and 1 shilling sterling to Paris, but, seeing that the operation would be advantageous through Hamburg, he remits to Hamburg at 35 shillings Flemish banco for a pound sterling, with orders to transmit the equivalent to Paris at 24 shillings banco for 3 francs, under deduction of 1 per cent for charges at Hamburg: what sum of livres tournois will Paris receive by such remittance?



|                    |                        |
|--------------------|------------------------|
| <i>Equation.</i>   | 456 1 = 12000 livres   |
| 1 pound sterling   | = 35 shillings Flemish |
| 1 shilling Flemish | = 6 shillings banco    |
| 24 shillings banco | = 3 francs             |
| 80 francs          | = 81 livres tournois   |
| 100                | = 99 with charges.     |

Thus, by the result of the operation, Paris would receive the sum that London had occasion to remit.

#### RULE,

*To place the Charges in the Equation.*

#### INDIRECT DRAFT.

A merchant at London has occasion to draw 12000 livres tournois upon Paris, but, as the medium of Hamburg would afford an advantage, he draws upon Hamburg at 35 shillings Flemish banco for one pound sterling, with orders to value upon Paris at 24 shillings banco for 3 francs, for the amount, inclusive of 1 per cent for commission, brokerage, and postages : what sum will London receive by the negotiation of such draft?

|                      |                        |
|----------------------|------------------------|
| <i>Equation.</i>     | 12000 livres = 447 0 5 |
| 81 livres            | = 80 francs            |
| 3 francs             | = 24 shillings banco   |
| 6 shillings banco    | = 1 shilling Flemish   |
| 35 shillings Flemish | = 1 pound sterling     |
| 101                  | = 100 with charges.    |

If London were to draw upon Hamburg for a sum of marcs equivalent with 12000 livres, it is evident that Hamburg must draw more upon Paris to effect its own reimbursement, inclusive of its charges. London must, therefore, draw upon Hamburg for the equivalent of 12000 livres, less the charges ; while Hamburg, in drawing upon Paris for the value of the draft from London, inclusive of the charges, would, in fact, occasion a disbursement of not more than 12000 livres at Paris.

N. B. London might order Hamburg to draw upon Paris for the value of 12000 livres, at 24, returning the amount to London at 35, under deduction of 1 per cent for the charges. In this case, the statement of the equation, and consequently the result, would be the same.

See the proof of this operation in the following page.



## RULE,

*To place the Charges in the Equation.*

## INDIRECT DRAFT.

*Proof of the preceding Operation.*

A merchant at London has occasion to draw the equivalent of 447 pounds 5 pence sterling in livres tournois, but, seeing that the operation would be advantageous through Hamburg, he draws upon Hamburg at 35 shillings Flemish banco for a pound sterling, with orders to value upon Paris at 24 shillings banco for 3 francs, inclusive of 1 per cent for commission, brokerage, and postages : what sum of livres tournois will Paris disburse by such draft ?

*Equation.*

|                    |                        |
|--------------------|------------------------|
|                    | 447 0 5 = 12000 livres |
| 1 pound sterling   | = 35 shillings Flemish |
| 1 shilling Flemish | = 6 shillings banco    |
| 24 shillings banco | = 3 francs             |
| 80 francs          | = 81 livres tournois   |
| 100 with charges   | = 101.                 |

Thus, by the result of the operation, Paris would disburse the sum that London had occasion to draw.

## RULE,

*To add, or to deduct, the Charges, in Operations by Logarithms.*

We have seen that the charges are to be added in those cases in which the profit is greater in proportion as the result is numerically reduced ; and, also, that the charges are to be deducted when a similar result becomes profitable in proportion as it is numerically increased.

Thus, if we had obtained  $61\frac{3}{16}$  as a proportional exchange between London and Lisbon, and were desirous of adding  $\frac{5}{8}$  for charges, it would be necessary to state the following proportion :

$$100 : 100\frac{5}{8} :: 61\frac{3}{16} : x;$$

and, in case it were intended to deduct the charges, it would be requisite that the proportion should be

$$100 : 99\frac{3}{8} :: 61\frac{3}{16} : x.$$

In performing the operation by logarithms, we should calculate as follows :



*First Proportion.*

$$\begin{array}{r} 61\frac{3}{16} = 178666 \\ 100\frac{5}{8} + 200271 \end{array}$$

$$\begin{array}{r} 378937 \\ 100 - 200000 \end{array}$$

$$178937 = 61\frac{9}{16} \text{ result.}$$

*Second Proportion.*

$$\begin{array}{r} 61\frac{3}{16} = 178666 \\ 99\frac{3}{8} + 199728 \end{array}$$

$$\begin{array}{r} 378394 \\ 100 - 200000 \end{array}$$

$$178394 = 60\frac{1}{8} \text{ result.}$$

These operations, however, may be simplified as is under-mentioned.

In the calculation of the first proportion, I have multiplied by  $100\frac{5}{8}$ , and divided by 100; that is, I have added the logarithm of  $100\frac{5}{8}$ , and deducted that of 100; but if I had deducted, mentally, the second logarithm from the first, which would have been effected by suppressing the characteristic of 100, I should have obtained the same result by the following addition:

$$\begin{array}{r} \text{Difference } 61\frac{3}{16} = 178666 \\ \frac{5}{8} + 271 \end{array}$$

$$178937 = 61\frac{9}{16} \text{ result.}$$

In the calculation of the second proportion, I have added the logarithm of  $99\frac{3}{8}$ , and deducted that of 100; but it is evident, that, if I had merely deducted the difference between the logarithms of these two numbers, I should have obtained the same result in the following manner:

$$\begin{array}{r} \text{Difference } 61\frac{3}{16} = 178666 \\ \frac{5}{8} - 272 \end{array}$$

$$178394 = 60\frac{1}{8} \text{ result.}$$

Hence I deduce the following rule:

In order to add the charges, that is, to augment the value of a number by  $\frac{5}{8}$ ,  $1\frac{5}{8}$ ,  $11\frac{5}{8}$ , more or less, per cent, find in the table the logarithm of 100 with addition of the amount of the charges; ascertain by how much that logarithm may exceed the logarithm 200000, which corresponds with the natural number 100, and



then add the surplus to the logarithm of the number which you wish to augment.

In order to deduct the charges, that is, to reduce the value of a number by  $\frac{5}{8}$ ,  $1\frac{5}{8}$ ,  $11\frac{5}{8}$ , more or less, per cent, find in the table the logarithm of 100 less the amount of the charges, which will be  $99\frac{3}{8}$ , if the charges be at the rate of  $\frac{5}{8}$  per cent, or  $98\frac{1}{4}$  if the rate be  $1\frac{5}{8}$ , &c.; ascertain the difference between that logarithm and the logarithm 200000, and deduct such difference from the logarithm of the number which you wish to reduce.

N. B. To facilitate the deduction of charges, an auxiliary table is given, shewing the difference between the logarithms of numbers under 100, and the logarithm of 100.

#### EXAMPLE.

Deduct from 45, rate of exchange between London and Genoa,  $\frac{7}{8}$  for charges.

Finding in the first table the logarithm of 45

to be . . . . . 165321

I perceive, by the auxiliary table, that the

logarithm of  $\frac{7}{8}$  is . . . . . 382

$$164939 = 44\frac{7}{8}$$

In fact, 382 is the difference between the logarithm of  $99\frac{1}{8}$  and that of 100.

#### RULE,

*To find the Rate per Cent of Profit.*

Instead of the certain price of exchange, always place 100 pounds sterling as the first term of the dividend.

Let the first term of the divisor, and the last term of the dividend, be each one pound sterling.

Include in the equation the direct course of exchange; and, when London exchanges by the pound sterling, that pound must be the last term of the dividend; but, when London gives the uncertain price, insert the number of pence given as the last term but one of the dividend, and, by opposing 240 pence to a pound sterling, the latter becomes the ultimate term of the dividend.

It follows from such equation, and from the denomination of the last term of the dividend being a pound sterling, that the quotient is necessarily in pounds sterling, which, when com-



pared with 100 pounds, first term of the dividend, points out the difference per cent.

N. B. The intermediate place which shall give the highest result above 100 will admit the most advantageous remittance ; and, on the other hand, the most advantageous draft will be through that place which may offer the lowest result under 100 ; it being of not any consequence, in this respect, whether London give the certain or the uncertain price.

The surplus of the highest result, above 100, will be the percentage of the profit in remitting, inclusive of the charges ; while the difference between 100 and the lowest result will be the rate of gain in drawing ; also inclusive of the charges.

### RULE,

*To find the Rate per Cent of Profit.*

LONDON AND PARIS

*Through HAMBURG.*

Required to know the rate per cent of profit resulting from the exchange between London and Paris, the pound sterling being worth 35 shillings 6 grotes Flemish banco at London ; 100 marcs banco being worth 197 livres tournois at Paris, and the direct exchange being at 25 livres 8 sols tournois per pound sterling.

*Equation.*

|                     |                         |
|---------------------|-------------------------|
| 100 pounds sterling | = £103 5                |
| 1 pound sterling    | = 35½ shillings Flemish |
| 8 shillings Flemish | = 3 marcs banco         |
| 100 marcs banco     | = 197 livres tournois   |
| 25½ livres tournois | = 1 pound sterling.     |

Thus, by remitting to Paris through Hamburg, London would gain £3 5 per cent, less the charges.

N. B. This operation being the same as that which is inserted in page 170, the result is the same as that of the application to remit, page 172, excepting a trifling difference of one penny, being the equivalent of the remainder of the calculation of the arbitration in the instance alluded to ; whence it appears that the operation to find the per centage is the most correct.



## RULE,

*To find the Rate per Cent of Profit.*

## LONDON AND AMSTERDAM

*Through LISBON.*

Required to know the rate per cent of profit resulting from the exchange between London and Amsterdam; milreis being worth 62 pence sterling at London, the crusade being worth 44½ grotes Flemish banco at Amsterdam, and the direct exchange being at 37 shillings 3 grotes Flemish banco per pound sterling.

*Equation.* 100 pounds sterling = £96 6 10  
 1 pound sterling = 240 pence  
 62 pence = 1000 reis  
 400 reis = 44½ grotes  
 12 grotes = 1 shilling Flemish  
 37¼ shill. Flemish = 1 pound sterling.

Thus, by the operation through Lisbon, in the instance of a draft, London would gain £3 13 2 per cent, less the charges.

N. B. This operation being the same as that which is inserted in page 140, the result is the same as that of the application to draw, page 142.

## RULE,

*To find the Rate per Cent of Profit.*

## LONDON AND LEGHORN

*Through PARIS.*

Required to know the rate per cent of profit resulting from the exchange between London and Leghorn; the pound sterling being worth 24 livres 15 sols tournois at London, the pezza of 8 reals being worth 104 sols in francs at Leghorn, and the direct exchange being at 50 pence sterling for the same pezza.

*Equation.* 100 pounds sterling = £97 18 8  
 1 pound sterling = 24½ livres tournois  
 81 livres tournois = 80 francs  
 1 franc = 20 sols  
 104 sols = 1 pezza  
 1 pezza = 50 pence  
 240 pence = 1 pound sterling.

Thus, by drawing upon Paris, London would gain £2 1 4 per cent, less the charges.



## LONDON AND VENICE.

*Rate per Cent of Profit.*

|                                                | Quotation at London. | Quotation from Venice. |
|------------------------------------------------|----------------------|------------------------|
| On Amsterdam.....                              | 38                   | 5                      |
| Genoa .....                                    | 45½                  | 38                     |
| Hamburg .....                                  | 35                   | 4 10                   |
| Leghorn .....                                  | 50                   | 11 15                  |
| Naples.....                                    | 39                   | 9 15                   |
| Paris .....                                    | 25 10                | 2 5                    |
| <i>Direct course of London on Venice .....</i> |                      | 58                     |

The above quotations are successively combined in the following arbitrations, to ascertain the rate per cent of profit.

*Through AMSTERDAM.*

|                        |                               |
|------------------------|-------------------------------|
|                        | 100 pounds sterling = £98 5 6 |
| 1 pound sterling =     | 3 florins banco               |
| 10 shillings Flemish = | 38 shillings Flemish          |
| 1 florin banco =       | 5 lire piccoli                |
| 58 lire piccoli =      | 1 pound sterling.             |

## GENOA.

|                    |                               |
|--------------------|-------------------------------|
|                    | 100 pounds sterling = £99 7 1 |
| 1 pound sterling = | 240 pence                     |
| 45½ pence =        | 1 pezza fuori di banco        |
| 1 pezza =          | 5¾ lire ditto                 |
| 1 lira =           | 38 soldi piccoli              |
| 20 soldi piccoli = | 1 lira piccoli                |
| 58 lire piccoli =  | 1 pound sterling.             |

## HAMBURG.

|                       |                                 |
|-----------------------|---------------------------------|
|                       | 100 pounds sterling = £101 16 7 |
| 1 pound sterling =    | 35 shillings Flemish            |
| 8 shillings Flemish = | 3 marcs banco                   |
| 1 marc banco =        | 4½ lire piccoli                 |
| 58 lire piccoli =     | 1 pound sterling.               |

## LEGHORN.

|                      |                               |
|----------------------|-------------------------------|
|                      | 100 pounds sterling = £97 4 9 |
| 1 pound sterling =   | 240 pence                     |
| 50 pence =           | 1 pezza of 8 reals            |
| 1 pezza of 8 reals = | 11¾ lire piccoli              |
| 58 lire piccoli =    | 1 pound sterling.             |

## NAPLES.

|                    |                                 |
|--------------------|---------------------------------|
|                    | 100 pounds sterling = £103 8 11 |
| 1 pound sterling = | 240 pence                       |
| 39 pence =         | 1 ducat di regno                |
| 1 ducat =          | 9¾ lire piccoli                 |
| 58 lire piccoli =  | 1 pound sterling.               |

## PARIS.

|                      |                                |
|----------------------|--------------------------------|
|                      | 100 pounds sterling = £97 14 0 |
| 1 pound sterling =   | 25½ livres tournois            |
| 81 livres tournois = | 80 francs                      |
| 1 franc =            | 2¼ lire piccoli                |
| 58 lire piccoli =    | 1 pound sterling.              |



## LONDON AND VENICE.

## CONCLUSION.

100 pounds sterling being supposed the par between London and Venice, Naples, which establishes the highest result, will answer to remit; while Leghorn, through which the lowest result is obtained, will answer to draw.

Thus, by remitting to Venice through Naples, London will gain £3 8 11 per cent, less the charges; and, in the instance of a draft, by the medium of Leghorn, the rate per cent of profit will be £2 15 3 per cent, also less the charges.

I conceive this mode of calculating arbitrations will be found superior, by the simplicity of its results, to that which is at present used, and which has for its object to ascertain the proportional exchange.

In fact, there is not any necessity for considering which be the certain or the uncertain price; whether it be requisite to add, or to deduct, the charges, or in which column they should be placed; nor for stating the recapitulation of the several pars of exchange. It will also be seen, that, by this mode, the great object of commercial calculations is attained, that is, to determine the per centage of profit by the same operation, as the charges are always to be deducted from the amount of such profit.



OF  
SPECULATIONS

IN  
**Exchange and Banking Operations.**

**I** HAVE considered, under the preceding head, Arbitrations of Exchange as a means of commercial economy, tending to the knowledge of those places upon which, or to which, it may be most suitable to draw or to remit. I shall now consider the subject in another relation, which is that of Banking Operations, of the nature of those which are called, in mercantile language, *Speculations*.

The variations which are daily possible, and may be said to happen daily, in the courses of exchange, offer a succession of opportunities of profit to those who devote their attention to the combinations of the courses of those exchanges blended in different manners: such profit, however, is not obtained but by means of constant and fixed attention to the continual fluctuation which occurs in the respective exchanges of the several places of business with each other.

When a speculative operation may present a profit, it is not necessary, in order to realize it, that the person who may have conceived it should have any funds, or disposable property, in a foreign place, any more than a debt to liquidate in that place. In fact, it is practicable to convey such funds from the place where the transaction originates to that whither it is directed, by remitting bills of exchange upon another place; or remittances may be made, either direct or indirect, to the place on which the operation may be effected, to obtain either direct returns, or indirect returns, in consequence of a new combination abroad, as to the place which may eventually afford the most advantage to the original projector.

These combinations offer, therefore, an extensive field to the experienced merchant who devotes his attention to the knowledge of the causes of the continual fluctuations which take place in the



courses of exchange, and who is able to anticipate the variations and consequences which may thereby ensue.

In a country, such as England, as rich in capital as in the productions of its industry, of its soil, and of its colonies, the imports and exports offer abundant means to speculators in exchanges of procuring a continual supply of bills of exchange, as well upon the countries with which we are in relation, as from those countries upon us; the quantity of this circulating value being always in direct proportion to the mass of our commerce, under the triple point of view of our imports, consumption, and exports.

It is obvious, however, that speculations in exchanges can only be productive of profit in proportion to the capital employed; and they are subject, at the same time, to several risks.

Such risks are,

1st, In respect to the changes which may occur in the courses of exchange, upon which the calculation may have been established, in the interval between the date of the quotations received and the time when the operation will be accomplished.

2dly, In the negligence, inattention, or want of ability on the part of any one of the correspondents of the projector, to whom he may have entrusted the execution of his orders, either absolute or conditional.

3dly, In the contingency that the bills of exchange, which are necessarily the medium of such operations, may possibly not be paid\*.

It will be easily conceived that a simple operation is less subject to risk, as there is only the variation of one exchange to be apprehended, which the experienced merchant can in general foresee; as he will be competent to give orders precise and positive, and not susceptible of a strained interpretation; and as he will be better able to judge of the solidity of the bills which he may take.

We must also consider, in speculations in exchange, the sum of the banking charges, that is, the commissions, brokerages, and postages of letters, which attach to the operations; and, further, the interest in the funds employed, in proportion as the periods of

\* The non-payment of bills purchased becomes, however, sometimes advantageous to the speculator by the re-exchange at which he may be reimbursed. But, as such advantage cannot be in his contemplation in the first instance, it may occasion a derangement of the plan conceived, and subject the speculator to a risk till the time of re-payment.



receipt, or of payment, may be anticipated or delayed, and which may affect the same operations, either advantageously or otherwise. The banking charges must be valued in the aggregate, and then deducted from the profit which the arbitration may have presented.

Upon the subject of the difference arising from the consideration of the interest upon the funds employed or received in anticipation, it may affect the result of the operation in several ways.

1st, If a merchant at London draws upon Hamburg to reimburse himself for the amount of a remittance thither, at the same time, in bills of exchange upon Paris, he will derive a profit of the interest upon the funds, from the time of the receipt of the amount for which the remittance may be negotiated at Hamburg to the time when the draft from London will become due. It would happen in like manner, if the merchant at London, instead of remitting bills upon Paris, should order his correspondent at Hamburg to draw upon Paris.

2dly, If a merchant at Lisbon, while he makes direct remittances to Hamburg, and orders his correspondent there to remit the amount to London, draws upon London for the amount of the same remittances, there will be a loss of the interest upon the funds from the time of the payment to be made at London of the draft from Lisbon, to the day of the receipt of the amount of the remittance from Hamburg.

I shall not extend these observations, as they are easily applicable to other cases.

#### OF VARIATIONS IN EXCHANGES.

The variations which the courses of exchange so frequently experience originate in several causes, which may be distinguished under the appellation of *ordinary* and *extraordinary*.

The *ordinary* causes are occasioned by the abundance, or scarcity, of bills of exchange; by the abundance, or scarcity, of money; by the consequences of the discovery of the advantages apparent by the calculation of proportional exchanges; and, lastly, by the financial operations of governments, or public establishments, such as the payment of subsidies and others.

The *extraordinary* causes are occasioned by the augmentation or diminution of the value of the circulating medium; by the depre-



ciation of the standard of coins ; and by the creation and forced circulation of a fictitious value.

### OF BANKING ORDERS.

The banking orders which merchants transmit to their correspondents abroad for drafts and remittances, and which are always accompanied by the courses of exchange by which those correspondents will have to effect the operations, are of several descriptions. I shall distinguish them into simple and compound, observing, however, that they admit of so much variety, and are presented under so many forms, that it is difficult to reduce them into a system.

Banking orders require, with few exceptions, a calculation either by the person who transmits them, or by the person who receives them. The following examples and questions will give an idea of the manner in which such orders are conceived, as well as of the methods employed to discover whether they be feasible.

#### FIRST EXAMPLE.

##### *Simple Banking Order.*

By advices received at London, it is known that a hurricane, which has spread destruction in our colonies upon their produce in general, has particularly affected that of cotton. From this intelligence, a merchant infers that an advance must follow in the price of that article, which will probably lead to a considerable importation of cotton from Lisbon. The effect of such importation will be, that, as paper upon London will be abundant at Lisbon, the course of exchange between the two places will rise. Supposing the actual course at London to be 60, the merchant will foresee that it may advance to 62 ; wherefore, in order to procure bills upon Lisbon, he will transmit an order to his correspondent at Hamburg expressed in similar terms to the following :

“ I authorize you to remit to me the value of ten thousand cru-  
 “ sades in paper upon Lisbon at usance, or usance and a half, for  
 “ which you will take your reimbursement upon me at two months  
 “ date, provided that you may be enabled to establish by the ope-  
 “ ration a proportional exchange of 60 between London and Lis-  
 “ bon, inclusive of all your own charges. This order is to be in  
 “ force till the arrival of the second post after the date of this  
 “ letter ; and if it should not be executed by that time, you will



"annul it, unless you should receive a subsequent confirmation of the order from me."

In fact, as the merchant at London presumes that the course of exchange may advance to 62, it follows, that, if his order be realized, and that such advance take place in the exchange at London upon Lisbon, there will be a profit by the negotiation at London of the paper which he will receive upon Lisbon, in the proportion of 60 to 62 per cent, independently of the interest upon the funds, arising from such negotiation, to the time when the bills drawn upon him for the equivalent may become due. Such an operation, however, would be more advantageous, if the same paper were remitted to Lisbon for direct returns.

#### *Execution of the Order at Hamburg.*

Upon the receipt of the order in question, Hamburg may draw upon London at 34 3, and take bills upon Lisbon at  $40\frac{3}{4}$ . It remains, therefore, to be ascertained, whether the combination of these prices will admit of the execution of the order within the limits prescribed, including in the calculation  $\frac{3}{4}$  per cent for the charges. For this purpose, as the merchant at Hamburg has to calculate the proportional exchange between London and Lisbon, he ranges the certain price of the exchange between those two places as the first term in the dividend.

|                                   |                          |
|-----------------------------------|--------------------------|
| <i>Equation.</i>                  | 1000 reis = $x$          |
| 400 reis                          | = $40\frac{3}{4}$ grotes |
| 12 grotes                         | = 1 shilling Flemish     |
| $34\frac{1}{4}$ shillings Flemish | = 240 pence sterling     |
| 100 with charges                  | = $100\frac{3}{4}$ .     |

#### *Operation by Logarithms.*

|                                       |                 |   |        |
|---------------------------------------|-----------------|---|--------|
| Fixed number                          | ..... 50        | = | 169897 |
| Hamburg on Lisbon..                   | $40\frac{3}{4}$ | + | 161013 |
| Difference of $\frac{3}{4}$ above.100 |                 | + | 325    |
|                                       |                 |   | <hr/>  |
|                                       |                 |   | 331235 |
| Hamburg on London .                   | $34\frac{1}{4}$ | — | 153466 |
|                                       |                 |   | <hr/>  |

177769 =  $59\frac{1}{8}$  result.

The result of this operation, which is  $59\frac{1}{8}$ , demonstrates that the order may be executed, since Hamburg purchases paper upon Lisbon at  $40\frac{3}{4}$ , takes its reimbursement upon London at 34 3, and, including  $\frac{3}{4}$  per cent charges, establishes a practical exchange



from London upon Lisbon at  $59\frac{1}{2}$ , being within the limits prescribed.

I have now to explain why I have ranged the charges in the column of the dividend.

In fact, as the merchant at Hamburg has purchased paper upon Lisbon, and therefore remitted to London 400 reis for  $40\frac{3}{4}$  grotes which he disburses, it follows that he must draw upon London for the value of  $40\frac{3}{4}$  grotes, with addition of  $\frac{3}{4}$  per cent for his charges; therefore 100 with addition of the charges, that is,  $100\frac{3}{4}$ , must be placed in the same column as  $40\frac{3}{4}$ .

This kind of Banking Orders is the most frequently used in business, as it does not require any calculation on the part of the person who transmits it, and as the chances incurred are of little consequence, and easily foreseen, while the realization of the orders very generally leaves an actual profit.

#### SECOND EXAMPLE.

##### *Compound Banking Order.*

I have before me the quotation of exchanges at London, and that which I have received from Hamburg; they are as follow:

|                | Quotation at London. | Quotation from Hamburg. |
|----------------|----------------------|-------------------------|
| Hamburg direct | 35 6                 | London direct ... 34    |
| Amsterdam      | 37 6                 | ..... 35                |
| Genoa          | 46                   | ..... $78\frac{1}{4}$   |
| Leghorn        | $50\frac{1}{2}$      | ..... 85                |
| Lisbon         | 61                   | ..... $41\frac{1}{8}$   |
| Madrid         | 35                   | ..... $81\frac{1}{2}$   |
| Paris          | 25 15                | ..... $24\frac{1}{8}$   |

Seeing that I can procure, at London, paper upon Hamburg at 35 6, and, by remitting it thither, obtain returns at 34, I calculate what the profit per cent may be resulting from that operation; stating the following proportion:

$$35\frac{1}{2} : 34 :: £100 : x.$$

It is evident that this proportion should be thus stated, since I disburse 1 pound sterling to purchase 35 shillings 6 grotes Flemish banco, and that I shall also receive in return 1 pound sterling as the price of 34 shillings Flemish. As the result must be less than 100, I must therefore place  $35\frac{1}{2}$  as the first term.



Performing the calculation, I find the result to be £95 15 6, which shews that the difference between £100 and £95 15 6, being £4 4 6, will be in my favour.

But, as I have already observed, I have to consider in this operation the banking charges, and the interest upon the funds which I shall employ, from the time of the payment of the remittances to be made, to the receipt of the amount of those which will be sent to me in return.

The banking charges at Hamburg will be  $\frac{1}{2}$  per cent commission, and  $\frac{1}{10}$  per cent brokerage, to which must be added the brokerage at London, and the expense of postages at both places. I shall consider the whole as  $\frac{3}{4}$  per cent, or 15 shillings. But, before I proceed, I may observe, that my correspondent at Hamburg would have a right to charge me  $\frac{1}{2}$  per cent commission for receiving the amount of my remittances, and  $\frac{1}{2}$  per cent more for the risk which he incurs by indorsing his remittances to myself; but, in consequence of the competition among the merchants in the principal places of business, the whole commission upon such an operation is reduced to  $\frac{1}{2}$  per cent.

In respect to the interest upon the sum which I disburse, I shall suppose that the bills which I take, and those which I shall receive, will be each at two usances. To the two usances, or 60 days, which are the term for the payment of the bills which I purchase, I add the 12 days grace allowed at Hamburg, and deduct from the sum the 3 days which I am allowed in London by the custom of deferring similar payments to the post-day following that of the actual transfer of the bills. I perceive, therefore, that there will be an interest current for 69 days, till the day when my correspondent at Hamburg will be in possession of the amount of the remittance. And, as the returns are to be made under discount, for the purpose of insuring the success of the operation as much as possible, and will be at 60 days date, I add to this number the 3 days of grace allowed at London, making 63, and, adding the latter to 69, it is evident that I should compute the interest upon my funds for the space of 132 days.

To this end, I state the following proportion,

$$7300 : 132 :: £100 : x,$$

which is reduced to dividing 132 by 73; and the quotient denotes that the rate of such interest is £1 16 2 per cent.



Proceeding to consider how the operation in general may affect the difference between £100 and £95 15 6, being .... £4 4 6 I find that I have to deduct for

|                       |         |               |
|-----------------------|---------|---------------|
| Banking charges ..... | £0 15 0 |               |
| Interest .....        | 1 16 2  |               |
|                       |         | <hr/> 2 11 2  |
|                       |         | <hr/> £1 13 4 |

and, in consequence of this result, which promises a clear profit of £1 13 4 per cent, I do not hesitate to purchase the bills in question upon Hamburg. But, before I remit them thither to order direct returns, it occurs to me to endeavour to discover whether it would not be more advantageous to me to receive indirect returns at prices which I may fix, and at which I may suppose that the order for such remittance might be executed.

With this view, and in order to find the proportional exchanges between Hamburg and London, through the other places, I collate the two quotations abovementioned, placing uniformly 1 pound sterling, or the certain price of exchange between London and Hamburg, as the first term in the dividend of the several equations; the whole as follows:

#### Through AMSTERDAM.

|                      |   |                          |
|----------------------|---|--------------------------|
|                      |   | 1 pound sterling = 34 3½ |
| 1 pound sterling     | = | 37½ shillings Flemish    |
| 10 shillings Flemish | = | 3 florins                |
| 1 florin             | = | 20 stivers               |
| 35 stivers banco     | = | 2 marcs banco            |
| 3 marcs              | = | 8 shillings Flemish.     |

#### GENOA.

|                  |   |                        |
|------------------|---|------------------------|
|                  |   | 1 pound sterling = 34  |
| 1 pound sterling | = | 240 pence ditto        |
| 46 pence         | = | 1 pezza fuori di banco |
| 1 pezza          | = | 78½ grotes             |
| 12 grotes        | = | 1 shilling Flemish.    |

#### LEGHORN.

|                  |   |                         |
|------------------|---|-------------------------|
|                  |   | 1 pound sterling = 33 8 |
| 1 pound sterling | = | 240 pence ditto         |
| 50½ pence        | = | 1 pezza of 8 reals      |
| 1 pezza          | = | 85 grotes               |
| 12 grotes        | = | 1 shilling Flemish.     |



*Through LISBON.*

|                  |   |                         |
|------------------|---|-------------------------|
| 1 pound sterling | = | 33 8 $\frac{1}{2}$      |
| 1 pound sterling | = | 240 pence ditto         |
| 61 pence         | = | 1000 reis               |
| 400 reis         | = | 41 $\frac{1}{8}$ grotes |
| 12 grotes        | = | 1 shilling Flemish.     |

## MADRID.

|                      |   |                         |
|----------------------|---|-------------------------|
| 1 pound sterling     | = | 33 9 $\frac{1}{4}$      |
| 1 pound sterling     | = | 240 pence ditto         |
| 35 pence             | = | 1 dollar of exchange    |
| 375 dollars of exch. | = | 272 ducats ditto        |
| 1 ducat ditto        | = | 81 $\frac{1}{2}$ grotes |
| 12 grotes            | = | 1 shilling Flemish.     |

## PARIS.

|                    |   |                                  |
|--------------------|---|----------------------------------|
| 1 pound sterling   | = | 34 1                             |
| 1 pound sterling   | = | 25 $\frac{3}{4}$ livres tournois |
| 81 livres tournois | = | 80 francs                        |
| 3 francs           | = | 24 $\frac{1}{8}$ shillings banco |
| 16 shillings banco | = | 1 marc banco                     |
| 3 marcs            | = | 8 shillings Flemish.             |

Upon examination of the results of these several calculations, I perceive that indirect returns upon Leghorn, Lisbon, or Madrid, would be the most advantageous to me, since I should disburse a smaller sum of shillings Flemish banco to receive a pound sterling, than if I were to cause a direct remittance to be purchased at 34. In remitting, therefore, to Hamburg the bills which I have taken upon that place, I direct my correspondent to make me the returns of the value in other bills, either upon Leghorn at 85, upon Lisbon at 41 $\frac{1}{8}$ , or upon Madrid at 81 $\frac{1}{2}$ , authorizing him, at the same time, in case the exchanges should have varied, to make use of that place which may be found, by a new combination, to present the greatest profit or the least loss. Such returns, independently of the advantage which they offer beyond the direct course, afford that also of putting me the sooner in possession of my funds, by the immediate negotiation which I shall effect at London of the indirect bills to be remitted to me.

N.B. The execution of this order will be seen hereafter, as the fourth question in Compound Banking Orders.



The two examples just mentioned will, I trust, be found sufficient to give an accurate idea of the nature of similar orders, and of the degree of precision which is required in their calculation. Let us now proceed to their solution.

#### OF THE RECEIPT AND EXECUTION OF BANKING ORDERS.

We have seen that merchants who speculate in exchanges give orders to their correspondents for drafts, or for remittances, pointing out to them the rates of exchange by which they are to be guided. It is not always, however, that those who receive the orders are enabled to execute them according to their strict import; and, as variations often occur in the courses, advantageous, perhaps, in part, to the principal, and in part disadvantageous, it can only be determined by calculation whether the orders received may be executed within the limits prescribed. It is this species of calculation which I shall develop in the two following instances.

#### CALCULATION OF SIMPLE BANKING ORDERS,

*By the Rule of Fraction.*

In a simple banking order, there is necessarily but one exchange of the same kind as the unknown exchange, which is represented by  $x$ . We place  $x$  in equation with this exchange, taken as the numerator of the first fraction. If  $x$ , or the result of the operation, ought to be greater than the same exchange, it will happen that the greatest of the two other exchanges, which are always of the same kind in respect to each other, will be the numerator of the second fraction, while the smallest exchange will be the denominator. In fact, it is obvious that the less the denominator may be, the greater will be the quotient; and the greater the denominator, the less the quotient.

The solution of the following questions will illustrate what may not be immediately understood by this rule.

#### SIMPLE BANKING ORDERS.

##### FIRST QUESTION.

London receives an order from Lisbon to draw upon Madrid at 35, and to make direct returns of the amount to Lisbon at 62: upon the receipt of this order, London cannot draw upon Madrid but at  $34\frac{1}{2}$ , and it is required to know at what rate London should remit to Lisbon, to counterbalance the loss upon the draft.



*Solution.*

Every place which gives the uncertain price should remit at the lowest exchange: thus, as London gives the uncertain price to Lisbon, it should remit thither at a lower exchange than 62, to counterbalance the loss upon Madrid. Therefore,

$$x = \frac{62 \times 34\frac{1}{2}}{35}.$$

As the exchange represented by  $x$  ought to be less than the limit prescribed for the returns, we must necessarily place the greatest of the two other exchanges as a denominator; whence  $x$  will be as much less than 62, as  $34\frac{1}{2}$  is less than 35.

*By Logarithms.*

$$62 = 179239$$

$$34\frac{1}{2} + 153782$$

$$\hline 333021$$

$$35 - 154407$$

$$\hline 178614 = 61\frac{1}{8} \text{ result.}$$

## SIMPLE BANKING ORDERS.

## SECOND QUESTION.

London receives an order from Hamburg to draw upon Oporto at  $61\frac{1}{2}$ , and to make direct returns to Hamburg at 35 3: upon the receipt of this order, London cannot remit to Hamburg but at 34 9; and it is required to know at what rate London should draw upon Oporto to counterbalance the loss that will be incurred by the remittance.

*Solution.*

Every place which gives the uncertain price should draw at the highest exchange. Thus, as London gives the uncertain price to Oporto, its draft upon the latter should be at a higher exchange than  $61\frac{1}{2}$ , to compensate the loss upon the remittance. Therefore,

$$x = \frac{61\frac{1}{2} \times 35\ 3}{34\ 9};$$

whence it is seen, that  $x$  must exceed  $61\frac{1}{2}$  in the same proportion that 35 3 exceeds 34 9; by which means the limits prescribed are preserved, since the loss incurred upon the remittance will be compensated by the profit acquired upon the draft.



*By Logarithms.*

$$61\frac{1}{2} = 178888$$

$$35\ 3 + 154716$$

---


$$333604$$

$$34\ 9 - 154095$$

---


$$179509 = 62\frac{3}{8} \text{ result.}$$

## SIMPLE BANKING ORDERS.

## THIRD QUESTION.

Paris gives an order to London to remit thither at 25 5, and to effect its reimbursement upon Amsterdam at 37 9: upon the receipt of this order, London cannot draw upon Amsterdam but at 38 3; and it is required to know at what rate London should remit to Paris, to compensate the loss which will be incurred upon the draft.

*Solution.*

Every place which gives the certain price should remit at the highest exchange: thus, as London gives the certain price to Paris, it should remit at a higher exchange than 25 5. Therefore,

$$x = \frac{25\ 5 \times 38\ 3}{37\ 9};$$

whence it is seen, that  $x$  must exceed 25 5 as much as 38 3 exceeds 37 9. There is not, therefore, any departure, upon the whole, from the limits prescribed, since the profit upon the remittance will compensate the loss upon the draft.

*By Logarithms.*

$$25\ 5 = 140226$$

$$38\ 3 + 158263$$

---


$$298489$$

$$37\ 9 - 157692$$

---


$$140797 = 25\ 11\frac{2}{3} \text{ result.}$$

## SIMPLE BANKING ORDERS.

## FOURTH QUESTION.

A merchant at Paris orders London to remit to him upon Leghorn at 50, and to effect its reimbursement upon Hamburg at 34 6: upon the receipt of this order, London cannot remit upon



Leghorn but at  $50\frac{3}{8}$ ; and it is required to know at what rate London should draw upon Hamburg, to compensate the loss by the remittance.

*Solution.*

Every place which gives the certain price should draw at the lowest exchange: thus, as London gives the certain price to Hamburg, its draft upon that place should be at a lower exchange than 34 6. Therefore,

$$x = \frac{34\ 6 \times 50}{50\frac{3}{8}}.$$

It is obvious, that, as  $x$  is as much lower than 34 6 as 50 is lower than  $50\frac{3}{8}$ , London will draw at a profit which will compensate the loss upon the remittance, and adjust the execution of the order to the proportions prescribed.

*By Logarithms.*

$$34\ 6 = 153782$$

$$50 \quad + 169897$$

$$\hline 323679$$

$$50\frac{3}{8} - 170222$$

$$\hline 153457 = 34\ 3 \text{ result.}$$

CALCULATION OF COMPOUND BANKING ORDERS.

*RULE.*

Make as many fractions as there may be places mentioned in the order, by taking the lowest exchange of the several places, each as the numerator of a fraction, and the highest as the denominator of the same fraction. The order may be always advantageously executed when the profit shall be represented by the smallest fraction, but it will be otherwise when the same fraction shall represent the loss. If it should not be obvious which may be the greatest and which the smallest of the given fractions, they may be reduced to a common denominator, or into decimals, by adding three ciphers to the numerator of each fraction, and dividing it by its denominator.

A fraction is greater or less in proportion as its numerator is more or less approximate to its denominator, which is invariably equivalent with unity.

The greater a fraction may be, the less will be the difference between its terms, and the less will be the profit or loss.



The less a fraction may be, the greater will be the difference between its terms, and, consequently, the greater will be the profit or loss.

## COMPOUND BANKING ORDERS.

## FIRST QUESTION.

A merchant at Paris orders London to draw upon Hamburg at 35, and to remit to him at 25 : upon the receipt of the order, the respective equivalents of a pound sterling at London are 36 shillings Flemish banco and 26 livres tournois. Required whether London may execute the order with advantage.

*Solution.*

$$\text{The fraction for Hamburg} = \frac{35}{36};$$

$$\text{That for Paris} \dots\dots\dots = \frac{25}{26}.$$

The exchange upon Hamburg has become comparatively unfavourable for drawing, but that upon Paris has improved for remitting. The fraction representing the profit being less than that representing the loss, it is evident that the operation is feasible.

## COMPOUND BANKING ORDERS.

## SECOND QUESTION.

A merchant at Amsterdam orders London to draw upon Madrid at  $34\frac{3}{8}$ , and to remit to him the amount upon Lisbon at  $61\frac{3}{4}$  : upon the receipt of the order, the exchange upon Madrid is at 35, and upon Lisbon at  $62\frac{1}{8}$ . Required whether London may execute the order with advantage.

*Solution.*

$$\text{The fraction for Madrid} = \frac{34\frac{3}{8}}{35} \text{ or } \frac{275}{280};$$

$$\text{That for Lisbon} \dots\dots\dots = \frac{61\frac{3}{4}}{62\frac{1}{8}} \text{ or } \frac{494}{497}.$$

The exchange upon Madrid has improved for drawing, and that upon Lisbon has become unfavourable for remitting. The fraction representing the profit being less than that representing the loss, it is evident that the order may be executed.



## COMPOUND BANKING ORDERS.

## THIRD QUESTION.

A merchant at Amsterdam orders London to draw upon Lisbon at  $61\frac{3}{4}$ , and to remit to him the equivalent upon Madrid at  $34\frac{3}{8}$ . When the order is received, the exchange upon Lisbon is at  $62\frac{1}{8}$ , and upon Madrid at 35. Required whether London may execute the order with advantage.

*Solution.*

$$\text{The fraction for Lisbon} = \frac{61\frac{3}{4}}{62\frac{1}{8}} \text{ or } \frac{494}{497};$$

$$\text{That for Madrid} . . . . = \frac{34\frac{3}{8}}{35} \text{ or } \frac{275}{280}.$$

The exchange upon Lisbon has improved for drawing, and that upon Madrid has become unfavourable for remitting; therefore, as the fraction representing the loss is less than its correlative representing the profit, the operation is not feasible.

## COMPOUND BANKING ORDERS.

## FOURTH QUESTION.

Hamburg receives an order from a merchant at London to remit him bills upon either of the undermentioned places which may present the most profit or the least loss, in case the exchanges should have varied. The limits are as follow: upon Leghorn 85; upon Lisbon  $41\frac{1}{8}$ ; and upon Madrid  $81\frac{1}{2}$ ; but, upon the receipt of the order, the exchange upon Leghorn is  $85\frac{1}{4}$ , upon Lisbon  $40\frac{7}{8}$ , and upon Madrid  $81\frac{1}{8}$ . Upon which place should Hamburg remit?

*Solution.*

$$\text{The fraction for Leghorn} = \frac{85}{85\frac{1}{4}} \text{ or } \frac{340}{341};$$

$$\text{That for Lisbon} . . . . = \frac{40\frac{7}{8}}{41\frac{1}{8}} \text{ or } \frac{327}{329};$$

$$\text{And that for Madrid} . . = \frac{81\frac{1}{8}}{81\frac{1}{2}} \text{ or } \frac{649}{652}.$$

Leghorn has become disadvantageous for remitting, but Lisbon and Madrid have improved. The fraction for Lisbon being less than that for Madrid, will afford the greatest profit, and the remittance to London should be, therefore, upon Lisbon, at  $40\frac{7}{8}$ .



## COMPOUND BANKING ORDERS.

## FIFTH QUESTION.

A merchant at London orders Paris to remit to him upon either of the undermentioned places, choosing that which will afford the greatest profit or leave the least loss, in case the exchanges should have varied. The limits given are the following: on Hamburg 189 10; on Genoa  $94\frac{2}{3}$ ; and on Leghorn  $101\frac{3}{4}$ : upon the receipt of the order, the exchange on Hamburg is at 188 15; on Genoa  $94\frac{1}{2}$ ; and on Leghorn  $101\frac{1}{4}$ . Required upon which place should Paris remit?

*Solution.*

$$\text{The fraction for Hamburg} = \frac{188\frac{3}{4}}{189\frac{1}{2}} \text{ or } \frac{755}{758} = 0.996;$$

$$\text{That for Genoa} \dots\dots\dots = \frac{94\frac{1}{2}}{94\frac{2}{3}} \text{ or } \frac{567}{568} = 0.998;$$

$$\text{And that for Leghorn} \dots\dots\dots = \frac{101\frac{1}{4}}{101\frac{3}{4}} \text{ or } \frac{405}{407} = 0.995.$$

As each of the three rates has become advantageous, the election will devolve upon the smallest fraction, as denoting the greatest profit. The remittance from Paris to London must be, therefore, upon Leghorn, at  $101\frac{1}{4}$ .

## COMPOUND BANKING ORDERS.

## SIXTH QUESTION.

London orders Paris to remit upon either of the undermentioned places, choosing that which will afford the greatest profit, or leave the least loss, in case the exchanges should have varied. The limits given are the following: on Hamburg 188 15; on Genoa  $94\frac{1}{2}$ ; and on Leghorn  $101\frac{1}{4}$ : upon receipt of the order, the exchange upon Hamburg is 189 10; upon Genoa  $94\frac{2}{3}$ ; upon Leghorn  $101\frac{3}{4}$ . Upon which place should Paris remit?

*Solution.*

$$\text{The fraction for Hamburg} = \frac{188\frac{3}{4}}{189\frac{1}{2}} \text{ or } \frac{755}{758} = 0.996;$$

$$\text{That for Genoa} \dots\dots\dots = \frac{94\frac{1}{2}}{94\frac{2}{3}} \text{ or } \frac{567}{568} = 0.998;$$

$$\text{And that for Leghorn} \dots\dots\dots = \frac{101\frac{1}{4}}{101\frac{3}{4}} \text{ or } \frac{405}{407} = 0.995.$$

As each of the three rates has become disadvantageous, it is evident that the choice should fall upon the greatest fraction, as leaving the least proportion of loss. The remittance from Paris to London should be, therefore, upon Genoa, at  $94\frac{2}{3}$ .



OF  
**Exchange Circulations.**

---

**IT** is well known, that, by the same reason that Public credit, which is no other than the credit of Government, upholds the Fabric of National Finance, the merchant is enabled, by the credit given to him individually, to extend his operations, as it were, indefinitely. Hence it is that a merchant of respectability can at pleasure obtain payment of the amount of any bills which he may choose to draw upon foreign places ; or, if he should direct his attention to the combinations which any of such places may afford, he may originate a series of those speculative operations which I am about to consider.

Exchange Circulations may, therefore, be truly said to be banking operations, performed entirely by means of credit.

They may be distinguished under two heads :

1st, Operations, by which the possessors of limited capital are enabled to undertake and sustain concerns of far greater magnitude, or by which a competency to future responsibility is made subservient to immediate or ultimate advantage.

2dly, Operations to which governments and public establishments have occasional recourse, either to fulfil subsidiary treaties, or to procure the importation of bullion and specie, or to effect a rise or fall in exchanges.

The operations in question are also frequently undertaken by persons who, to elicit a momentary resource, incur a responsibility to which they are not competent. It is in consequence of this practice that an unfavourable idea is in general associated with the word *circulation* ; since it is obvious that a person in circumstances of embarrassment profits by his remaining credit, merely to delay, by such means, the event of his failure, at the same time that it may be rendered fatal to the correspondents who may have supported the illusive circulation. It may be farther observed, that, by the progress of the loss of credit, the operations will be restricted to a few places, and, as the terms of



their execution must be also circumscribed, their results may be presumed to be in general unprofitable. Dispensing, therefore, with any farther consideration of this practice of exchange circulations, which cannot be too much reprehended, I shall proceed to speak of the two sorts just mentioned.

The object of the former is, that of facilitating extensive enterprize, and of sustaining speculations, the realization of which is more or less remote. The basis of this sort of circulations is the possession, or the competency to possess, indubitable means of liquidating the drafts which are the consequence of the speculation, but it is to be observed, that the banking operations, which are the medium, are matters of great nicety. In fact, it is essential, not only that the speculator should not commit his credit by equivocal undertakings, but also that they should be combined so as not to absorb, by their consequences, the profit expected from the speculation which they were intended to facilitate.

It is therefore fundamentally necessary to be well versed in the knowledge of arbitrations of exchange; to possess an established credit with those who may be the agents of the circulation abroad; and to calculate the term when the circulation may have been accomplished, in order, if necessary, to extend or to renew it. Great care should also be taken to reimburse with exactness, and plausibility of appearance, the merchants employed abroad; especially avoiding to propose any operations which may appear to them to be prejudicial to the speculator, since a discovery of that nature would engender conclusions unfavourable to his credit.

Let us now endeavour to apply the practical part of these principles to the following operations.

#### FIRST CIRCULATION.

A merchant at London deducing, from various circumstances, that a considerable advance may be expected in the price of cotton, sends orders to Lisbon for purchases of that article, and opens a credit upon Paris for the amount in favour of his correspondent at Lisbon. As, however, it is supposed that the advance upon the price of cotton will not be immediate, but progressive, it is requisite that the sale be delayed until the prices be such as the speculator contemplated. Having, in the mean while, to furnish Paris with funds for the drafts from Lisbon at



100 days date, he discovers, by the combination of several quotations of exchange, that it would be advantageous to give orders to Hamburg to remit to Paris, and to re-draw upon Madrid at 3 months date. In fact, Hamburg draws upon Madrid, and, as the latter re-draws upon London at usance and a half, it is evident that the merchant at London has obtained, by this circulation, the use of funds during the space of at least eight months; while he might procure, by similar means, the use of other funds, if he had not yet sold his cotton.

## SECOND CIRCULATION.

A merchant at London being desirous of procuring the use of a sum of money for twelve months, draws upon Lisbon at 90 days date, ordering Lisbon to effect its reimbursement upon Leghorn at 3 months; Leghorn to draw upon Hamburg in succession, also, at 3 months; and, at length, Hamburg to take its reimbursement upon London at 3 usances. London draws at  $60\frac{1}{2}$ ; Lisbon at 830; Leghorn at  $86\frac{3}{4}$ ; and Hamburg at 34 10. Required the proportional exchange between London and Lisbon, resulting from the several rates given.

*Equation.*

|                                   |   |                             |
|-----------------------------------|---|-----------------------------|
|                                   |   | 1000 reis = 60 pence result |
| 830 reis                          | = | 1 pezza                     |
| 1 pezza                           | = | $86\frac{3}{4}$ grotes      |
| 12 grotes                         | = | 1 shilling Flemish          |
| $34\frac{1}{2}$ shillings Flemish | = | 240 pence sterling.         |

Hence it appears that the milreis, for which London has received  $60\frac{1}{2}$  pence by drawing upon Lisbon, are repaid, 12 months afterwards, at the rate of 60: independently, therefore, of the profit by the exchange, there would still be an advantage upon the interest of the amount, after deducting the banking charges, which may be estimated at  $\frac{3}{4}$  per cent in each place, or  $2\frac{1}{4}$  per cent upon the whole.

In this circulation there is necessarily a greater degree of contingency than in the former, and the consequences might be otherwise dangerous, by reason of eventual variations in the exchanges in the interval between the transmission of the orders and their execution.

Let us now consider the second kind of circulations.

Governments, and public establishments, are sometimes induced by political events, by circumstances of difficulty, or other



special considerations, to have recourse to exchange circulations. In particular, we have witnessed a circulation instituted to facilitate to Spain the means of fulfilling a treaty of subsidy to be paid to France.

In the year 1804, which was so fatal to Spain by epidemical ravage and famine, her commerce was paralyzed, and her exchanges with foreign countries depreciated. The subsidy claimed of the government was immense, comparatively with its effective resources; and to accomplish the payment of it there were only three direct methods, either to send dollars to Paris by land, or to remit thither bills of exchange, or to enable Paris to draw upon Spain.

The former of these means was at first carried into effect; but it was found to be slow and expensive. The two others tended to depreciate still farther the exchange upon Spain; and, indeed, the Spanish government, which had not then received the supplies expected from its colonies, was unprovided with sufficient capital to make good the necessary payments.

On the other hand, the conditions of the treaty were absolute, and the wants of France were urgent; it was therefore indispensable that expedients should be devised to enable Spain to satisfy the demands of France, and to await the arrival of her own treasures. The expedient which was in fact adopted, was that of establishing an exchange circulation; and it is to be observed that it was essential that it should be conducted with address, in order that its consequences might not occasion the depreciation of the exchange of the country which sought facility from the measure. An eminent merchant at Paris was invested with the management of this operation, which he adjusted as follows. Hamburg, Amsterdam, Paris, London, Madrid, and Cadiz, were to be the hinges upon which the circulation was to turn; and Leghorn, Genoa, and Lisbon, being of minor importance in exchange operations, were only considered as accessories. The first step to be taken was, to obtain the consent of one or of several merchants, in each of the places abovementioned, to become parties in the circulation, and to support it by their capital and by their credit. With this view, the resources which Spain would possess, to ensure the payment of the drafts which would ensue from the circulation, were detailed by the said merchant in his correspondence: he alluded to the remittances in specie which the Spanish government expected from its colonies; and, above



all, he dwelt upon the confidence which was to be reposed in the banking house of Madrid, in whose hands the government had already placed the effective resources which it then possessed, and to whom it would transfer its future supplies.

The principle being thus established, it only remained to regulate the extent of the operations from Paris, and from the other places, so as not to issue too much paper upon Spain, at the same time that the circulation might receive as much support as possible from real business. With this view, London was chosen as a place upon which the circulation might be in part directed. In fact, the price of dollars being then very high in London, this circumstance was of itself sufficient to establish a proportional exchange with Spain, of great advantage to the latter.

The first movement was commenced at Paris, where the negotiation of the drafts issued upon the several places abovementioned served, in the first instance, to procure funds to effect the more urgent payments, at the same time that orders were transmitted to Hamburg and Amsterdam to draw considerable sums, chiefly upon London, Madrid, and Cadiz, and to invest the amount in remittances upon Paris.

In order that the circulation might proceed with regularity, an active correspondence was established between the merchants who conducted it. Credits were respectively opened by the house at Paris, and the orders which it issued were punctually confirmed by its colleagues at Madrid.

Dispensing, however, with the details of the operation in question, which may be easily deduced from what has been said, I shall state an account of the result of the sale of the first consignment of dollars which were sent from Cadiz to London, and which served in part to liquidate the drafts which had been issued upon the latter. It will be perceived that not any thing could be more judicious than the proceedings adopted.

#### INVOICE from CADIZ.

| Hard Dollars.                                                            | Reals of Vellon. |
|--------------------------------------------------------------------------|------------------|
| 300000 equal to .....                                                    | 6000000          |
| Exportation duty, at 1323 reals 23 maravedis per 1000 hard dollars ..... | 397102 32        |
| Brokerage $\frac{1}{4}$ per cent .....                                   | 15993 18         |
| Petty charges .....                                                      | 313 27           |
| Premium of insurance, at 2 per cent, and policy .....                    | 127983 11        |
|                                                                          | <hr/>            |
|                                                                          | 6541393 20       |



## CHARGES at LONDON.

Freight, 1 per cent; carriage from Portsmouth,  $\frac{1}{4}$ ; brokerage and commission,  $\frac{5}{8}$ ; and petty charges, 31 shillings 6 pence upon the whole.

Hence the several charges, both at Cadiz and London, amount to 11 per cent; and as the dollars were sold at 5 shillings 7 pence per ounce, and weighed  $866\frac{1}{4}$  ounces per 1000 dollars, such remittance established a proportional exchange of  $39\frac{9}{24}$ , instead of the direct course of Cadiz upon London, which was at 36, and of that of London upon Cadiz, which was at  $34\frac{5}{8}$ .

*Example.*

|                          |                                               |
|--------------------------|-----------------------------------------------|
|                          | 1 dollar of exchange = $39\frac{9}{24}$ pence |
| 85 dollars of exchange = | 64 hard dollars                               |
| 1000 hard dollars =      | $866\frac{1}{4}$ ounces                       |
| 1 ounce =                | 67 pence                                      |
| 111 =                    | 100 with charges.                             |

It may be observed in general in respect to the drafts which were issued from the several places upon the Continent, and to those which were not liquidated in London by the remittance of dollars, that the payment was progressively effected in Spain, after the lapse of the intermediate time employed in the circulation; so that the object was fully accomplished of raising immediate supplies upon the basis of future competency.

I presume that what has been said will have sufficiently shewn the importance of exchange circulations, and of the resources which they afford when prudently directed by intelligent merchants.



## OF OPERATIONS

### OF Specie and Bullion.

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**HAVING** considered, in the preceding pages, the operations of exchange under their several points of view, and examined their various degrees of utility in business, I think it now expedient to treat of the operations of gold and silver in specie and in bullion. Such operations are intimately connected with those in exchange, one of their principal objects being that of discovering the price of exchange which may be established between two contracting places, in consequence of the purchase of a certain quantity of specie or bullion in one of those places, and of the sale of the same quantity in the other.

I shall confine myself, however, to treating of such operations only as result from the commerce of precious metals carried on by England with France, Hamburg, Holland, Portugal, and Spain; but the rules and examples which I shall furnish, the exposition of the differences of standard and conditions of sale, as well as the relation of weights, which will be found either in this part of my work, or in a subsequent part relating to monies, weights, and measures, generally, will afford the means of resolving any sort of calculation which may not have been foreseen.

Before I enter upon the subject, I shall consider the nature and properties of the two metals which are the basis of this commerce, and also advert to the two other metals which are used in the alloy, or adulteration, of the former.

## OF CERTAIN METALS.

### GOLD.

Among the inherent qualities of this metal, one of the most remarkable is that of greater indestructibility, and therefore perfection, than is possessed by any other. It is unalterable by air or



water, and is not subject to rust. When it is in its greatest purity, it is not sonorous, has very little elasticity, and is exceedingly soft and flexible, and more ductile than any other substance hitherto enumerated in metallurgy. It melts at  $32^{\circ}$  *Wedgwood*, and burns only when submitted to the galvanic or electric spark. It may be volatilized and calcined in high and long continued heats. Gold mingles in fusion with all metals, but, excepting copper, they debase its colour, which is reddish yellow. Its malleability is also impaired by all the other metals, but in a less degree by copper and by silver than by others. The divisibility of gold is prodigious. If a pound of silver be melted with a single grain of gold, the gold will be equally diffused through the whole silver; so that, taking one grain from any part of the mass (in which there can be no more than the 5760th part of a grain of gold), and dissolving it in *aquafortis*, the gold will fall to the bottom.

A grain of gold may be extended into a leaf containing 56 square inches, and this leaf may be divided into 560,000 visible parts. For an inch in length may be divided into 100 parts, every one of which will be visible to the naked eye: consequently, a square inch may be divided into 10,000 parts, and 56 square inches into 560,000. Such leaves are commonly used in gilding; and their tenuity is such, that if 124,500 were laid upon one another, and pressed together, they would not exceed an inch in thickness. The tenacity of the parts of gold is also very surprising; for a wire of  $\frac{1}{10}$  of an inch in diameter will support a weight of 500 pounds.

#### SILVER.

This metal, being the whitest, is more brilliant than any other, since it reflects a greater degree of light. It is somewhat harder and more sonorous than gold, fusible with a less degree of heat, and its ductility is not greatly inferior. A single grain has been drawn into a wire three yards long, which has been flattened into a plate an inch broad: the tenacity of its parts is nearly one half less than that of gold, for a silver wire of  $\frac{1}{10}$  of an inch in diameter is unable to bear more than 270 pounds; and, in respect to their greatest tenuity, the wire used for astronomical purposes measures only the 750th part of an inch in diameter.

#### COPPER,

When pure, is of a pale red colour, which easily tarnishes in a moist air, and, by continued exposure, the metal itself contracts a



green rust. It is the most sonorous of all the metals ; and its ductility, hardness, and tenacity, are very considerable ; for it may be drawn into wires as fine as hair, or beaten into leaves almost as thin as those of silver ; and a wire of  $\frac{1}{10}$  of an inch in diameter will support a weight of  $299\frac{1}{2}$  pounds.

#### PLATINA.

The name of this metal is a diminutive of *plata*, which is the Spanish name for silver, and it is so called in allusion to its colour ; in fact, when properly refined, its colour is something between that of iron and silver : it is the heaviest body hitherto known, and the hardest and most durable of all the metals. Platina is likewise extremely ductile, the most infusible substance yet analyzed ; and the tenacity of its parts is stronger than that of gold, whence it has been called *white gold*. It is found in the gold mines in the territory of Choco, in Peru ; and as it may be employed, by reason of its great specific weight, in adulterating gold, the court of Spain has taken measures to prevent its exportation.

#### OF THE SPECIFIC GRAVITY OF CERTAIN METALS.

By *specific gravity* is meant the weight, in water, of any substance, with reference to its bulk.

The art of weighing different bodies in water, and thereby finding their specific gravities, or weights, bulk for bulk, was invented by Archimedes ; of which we have the following account.

Hiero, king of Syracuse, having applied to Archimedes to discover whether a crown made for the king, and asserted by the artist to be of pure gold, were not alloyed with copper, the philosopher deduced the means, till then unknown, of ascertaining the fact from a casual occurrence. For going into a bathing-tub of water, and observing that he thereby raised the water, he concluded that he had raised it just as high as would have been effected by any other substance corresponding exactly with his own bulk : and considering that any other body of equal weight, and of less bulk than himself, could not have raised the water so high as he did, he immediately told the king that he had found a method by which he could discover whether there were any cheat in the manufacture of the crown ; for gold being heavier than silver or copper, must be of less bulk than that of the same weight of either of



those metals. He therefore desired that a mass of pure gold equally heavy with the crown, when weighed in the air, should be weighed against it in water, and, if the crown were alloyed, it would not then counterpoise the mass of gold. And upon making the trial, he found that the mass of gold weighed much heavier in water than the crown; and also, when the mass and the crown were immersed separately in one vessel of water, the elevation of the water occasioned by the crown was much greater than that occasioned by the mass. Thus by making trials with different metals, all equally heavy with the crown when weighed in the air, he found out the quantity of alloy in the crown.

Such is the asserted origin of the hydrostatic balance, which differs very little from a common balance nicely made: it has a hook at the bottom of each scale, on which may be hung small weights depending from horse hairs, or from silken threads; so that, while the scales themselves remain in the air, the bodies suspended from them may be immersed in water.

If a body in one of those scales be counterpoised in the air by weights in the other scale, and if the same body be only suspended from the hook, and immersed into water, the equilibrium will be immediately destroyed. Then if, without altering those weights, as much weight be put into the scale from which the body hangs as will restore the equilibrium, that weight will be equal to the weight of a quantity of water of the magnitude of the immersed body; and if the weight of the body in the air be divided by its apparent loss in the water, that is, by that weight which restores the equilibrium, the quotient will then shew how much that body may be heavier than its bulk of water. Hence the following principle, that the specific gravity of bodies is their weight, with reference to an equal bulk of rain or distilled water, the latter being the standard with which every other body is compared.

It is by such process that the specific gravity of gold has been found to be to that of water as 19.3 to 1; that of silver as 10.51 to 1; that of copper as 8.58 to 1; and that of platina as 22.5 to 1. To conclude, the hydrostatic balance affords a certain method of discovering mixtures of metals without affecting their parts; but such are the care and accuracy required in the operation, that the greater number of chemists who have resorted to it do not agree in their results, for which reason the hydrostatic balance is not adopted in practice, in respect to the sale of gold and silver.



## LONDON.

The weight used for the appreciation of precious metals is the pound, called Troy-weight, which was introduced into England, in 1066, by William the Conqueror. It derived its origin from the pound instituted by Charlemagne, and its name from Troyes, a city of Champagne, where it was first adopted. The pound troy is divided into 12 ounces, each of 20 pennyweights, which are each divided into 24 grains. The pound is therefore composed of 5760 grains, and the ounce of 480 grains: by a peculiar subdivision of the latter into 20 mites, of a mite into 24 droits, of a droit into 20 perlots, and, finally, of a perlot into 24 blanks, it required no less than 230,400 blanks to compose a grain; but the lowest denomination which is now practically used is that of the grain.

The weight agreed upon as the unit of reference of fine gold is that of 24 carats; and in order to express the degrees of inferior fineness, the carat is itself divided into 4 grains, which, being of a different weight from the grains of the pound troy, are distinguished by the appellation of carat-grains. The fractions of such grains have not any particular denomination. Standard gold is that which is to fine gold as 22 are to 24; or, in other words, it is of 22 carats, or 88 carat-grains, being the degree of fineness which is used in the coinage of this metal, and which is also understood when we speak of the commercial price of gold. In the mass, therefore, weighing 24 carats, which we call a pound of standard gold, there are 22 carats of fine gold, the supplementary quantities introduced being 1 carat of fine silver, and 1 carat of fine copper.

The weight agreed upon as the unit of reference of fine silver is that of 12 ounces, each of which is divided into 20 pennyweights, and these are again subdivided into grains of the pound troy. Standard silver is to fine silver in the proportion of 11 ounces 2 pennyweights, or  $\frac{37}{40}$ , being the degree of fineness which is referred to in the commercial price of silver, and used in the coinage of this metal. In the mass, therefore, weighing 12 ounces, which we call a pound of standard silver, there are 11 oz 2 dwts of fine silver, with addition of 18 dwts of fine copper.

In order to ascertain the degree of fineness of the metals which the Bank of England purchases, they are assayed at the Mint. In



this process, the refiner prepares his materials by taking a few grains of the metal to be assayed, whether cuttings or scrapings; and, cleansing them from dross, he puts them into the cupel, or test, with a piece of clean lead on the fire, till it be refined to the highest degree. After taking the metal from the fire, the refiner lets it cool, beats it clean, and, having a pair of scales curiously glazed, he puts the refined metal into one scale, and a weight corresponding with the weight of the metal before the operation into the other scale. He then weighs the cupelled metal, computing, by the loss of weight upon the quantity taken, the proportion of loss which there would have been, if a pound or an ounce had been cupelled. By this means, the degree of purity of the mass itself is accurately determined at the Bank, according to the written report of the assay-master, which, in respect to gold, is in carats, carat-grains, and the fractions thereof; and, in respect to silver, in ounces, pennyweights, and half pennyweights.

*Quotation at London.*

*Sold at more or less.*

|                            |    |    |   |                     |
|----------------------------|----|----|---|---------------------|
| Portugal gold in coin..... | £4 | 0  | 0 | per ounce weight.   |
| Foreign gold in bars ..... | 4  | 0  | 0 | per ounce standard. |
| New doubloons .....        | 3  | 19 | 6 | per ounce weight.   |
| New dollars.....           | 0  | 5  | 3 | per ounce weight.   |
| Silver in bars .....       | 0  | 5  | 4 | per ounce standard. |

Bullion and foreign coin of gold and silver may be imported duty free.

The exportation of bullion is prohibited, unless a certificate be produced from the court of the lord-mayor and aldermen of London to the commissioners for collecting his majesty's customs, that such bullion is foreign, and not molten from coins of this realm, or clippings thereof, nor from plate wrought in this kingdom.

The exportation of gold and silver coin is also prohibited, without the king's license, except foreign coin upon entry.

*Observations on the Relation of the different Weights used in England, and in some other Countries, in respect to the Commerce of precious Metals.*

The relation of an ounce, English troy-weight, to an ounce, *poids de marc*, of France, was determined by the celebrated Newton :: 63 : 64; that is, that 63 ounces English were equi-



valent to 64 ounces French. It would even appear, that the Royal Society of London and the Academy of Sciences at Paris had agreed to consider such proportion as exact, in which case the French ounce would be equivalent to  $472\frac{1}{2}$  grains, troy-weight, as will be seen by the following operation :

$$\begin{aligned} & 1 \text{ ounce of France} = 472\frac{1}{2} \text{ grains} \\ 64 \text{ ounces of France} & = 63 \text{ ounces of England} \\ 1 \text{ ounce of England} & = 480 \text{ grains.} \end{aligned}$$

Upon the ground, however, of subsequent assays made by Mr. Tillet, the pound of 12 ounces English has been compared to 12 ounces 1 gros 37 grains, or 7021 grains French ; whence it follows that the French ounce would be equivalent to  $472\frac{1}{4}$  grains, according to the following example :

$$\begin{aligned} & 1 \text{ ounce of France} = 472\frac{1}{4} \text{ grains} \\ 1 \text{ ounce of France} & = 576 \text{ grains of France} \\ 7021 \text{ grains of France} & = 5760 \text{ grains of England.} \end{aligned}$$

Nevertheless, the result of the commercial operations between these two countries has not always coincided either with the one or with the other of the abovementioned criteria of calculation ; for it appears, by strictures upon the accounts of the gold imported from France into England, that the proportion generally resulting here is that of 60 to 61, while similar importations into France from England determine the existence of a like difference in a contrary sense, the proportion being from 67 to 68. The difference itself may be not improbably derived from the manner of weighing the metal either at the Bank of England, or at the Mint at Paris, or at both ; and as the respective results are still less concordant than the criteria of Newton and Tillet, I have adopted, in my calculations of gold and silver ingots, that of Newton, as a middle course between the two proportions just mentioned, and the rather, as they are subject to some variation.

Kruse has determined, by experiments made at Hamburg, the equality of 60 marcs of Hamburg to 451 ounces troy-weight of England ; whence it would result that a marc of Hamburg would be equivalent to 3608 grains, troy-weight.

Other experiments have led, in like manner, to a comparison of 8 marcs of fine silver of Hamburg with 65 ounces of standard silver of England ; whence it would result that a marc of Hamburg would be equivalent to  $3607\frac{1}{2}$  grains, troy-weight : thus,



|                         |                        |                               |
|-------------------------|------------------------|-------------------------------|
|                         | 1 marc fine of Hamburg | = 3607 $\frac{1}{2}$ grs.     |
| 8 marcs fine of Hamburg | =                      | 65 ounces standard of England |
| 40 ounces standard      | =                      | 37 ounces fine                |
| 1 ounce fine            | =                      | 480 grains.                   |

The correctness of the former of such results having been confirmed by several writers, I have adopted it in my calculations.

According to assays by Mr. Tillet, the marc of Holland weighs 4629 grains of France, of which 7021 are equivalent to the pound of England : it follows, that the marc of Holland is equivalent to 3797 $\frac{5}{8}$  grains English : in fact,

|                       |                   |                             |
|-----------------------|-------------------|-----------------------------|
|                       | 1 marc of Holland | = 3797 $\frac{5}{8}$ grains |
| 1 marc of Holland     | =                 | 4629 grains of France       |
| 7021 grains of France | =                 | 5760 grains of England.     |

Kruse has determined, by other assays, the relation of the marc of Holland to that of Hamburg to be :: 19 : 20 ; and, as 60 marcs of the latter are equivalent to 451 ounces of England, a result very nearly the same is obtained by the following calculation :

|                     |                   |                             |
|---------------------|-------------------|-----------------------------|
|                     | 1 marc of Holland | = 3797 $\frac{1}{2}$ grains |
| 19 marcs of Holland | =                 | 20 marcs of Hamburg         |
| 60 marcs of Hamburg | =                 | 451 ounces of England       |
| 1 ounce of England  | =                 | 480 grains.                 |

It is from such data that I have deduced for my calculations the relation of the marc of Holland to the ounce of England to be :: 80 : 633 ; in fact,

|                     |                   |                       |
|---------------------|-------------------|-----------------------|
|                     | 1 marc of Holland | = 3798 grains         |
| 80 marcs of Holland | =                 | 633 ounces of England |
| 1 ounce of England  | =                 | 480 grains.           |

According to Mr. Tillet, the marc of Portugal weighs 4318 grains of France, of which 7021 are equal to a pound of England ; whence the marc of Portugal may be compared to 3542 $\frac{5}{11}$  grains, troy-weight ; in fact,

|                       |                    |                              |
|-----------------------|--------------------|------------------------------|
|                       | 1 marc of Portugal | = 3542 $\frac{5}{11}$ grains |
| 1 marc of Portugal    | =                  | 4318 grains of France        |
| 7021 grains of France | =                  | 5760 grains of England.      |

From such proportion, adopted by Marien, I have deduced the equivalence of 50 marcs of Portugal to 369 ounces of England, being a relation which gives very nearly the same result, and of which I have made use in my calculations.

|                      |                    |                             |
|----------------------|--------------------|-----------------------------|
|                      | 1 marc of Portugal | = 3542 $\frac{2}{3}$ grains |
| 50 marcs of Portugal | =                  | 369 ounces of England       |
| 1 ounce of England   | =                  | 480 grains.                 |



It is observable, however, that the ingots of gold imported from Brazil do not always render the weight just mentioned, owing, no doubt, to an incorrectness in the mode of weighing in that country.

The actual importation of Portugal gold in coin is considerable; and 400 pieces known in Portugal under the name of *meyas boas*, and in England under that of Joaneses, when new, and received at the Bank of England, have been known to weigh 185 ounces; but as the general weight of those purchased by the Bank is from 184 to 184½ ounces, I have made use of the proportion of 184½ ounces to 400 Joaneses.

It may be observed, that, as the standard of the moidores is inferior to that of the Joaneses, the Bank purchases them at two-pence sterling per ounce less than the latter.

According to assays made by Mr. Tillet, the marc of Castille is equivalent to 4328 grains of France, of which 7021 are equivalent to a pound of England; whence it would result that the marc of Castille would be equivalent to 3550⅔ grains; in fact,

$$\begin{aligned} 1 \text{ marc of Castille} &= 3550\frac{2}{3} \text{ grains} \\ 1 \text{ marc of Castille} &= 4328 \text{ grains of France} \\ 7021 \text{ grains of France} &= 5760 \text{ grains of England.} \end{aligned}$$

Spanish dollars being also an article of considerable commerce, furnish other points of comparison, in respect to the weights of England, either with those of Spain, or with those of other countries. In fact, admitting that 1000 new dollars weigh 117¼ marcs in Spain, and 867½ ounces in England, we may hence compare the marc of Castille to 3551⅓ grains troy-weight, according to the following example:

$$\begin{aligned} 1 \text{ marc of Castille} &= 3551\frac{1}{3} \text{ grains} \\ 117\frac{1}{4} \text{ marcs of Castille} &= 867\frac{1}{2} \text{ ounces of England} \\ 1 \text{ ounce of England} &= 480 \text{ grains.} \end{aligned}$$

It is from such data that I have determined the equivalence of 5 marcs of Castille to 37 ounces of England, being the proportion of which I have made use in my calculations of gold and silver ingots, and which affords a result differing but little from the abovementioned.

$$\begin{aligned} 1 \text{ marc of Castille} &= 3552 \text{ grains} \\ 5 \text{ marcs of Castille} &= 37 \text{ ounces of England} \\ 1 \text{ ounce of England} &= 480 \text{ grains.} \end{aligned}$$



1000 Spanish dollars, when quite new, have been known to weigh 868 ounces; it is but seldom, however, that they reach even the weight of  $867\frac{1}{2}$  ounces, since those imported from Cadiz, without having been circulated, do not, in general, render more than  $866\frac{1}{4}$  ounces; while those imported from other parts where the remittances are not received direct from South America, do not, in general, render more than 865 ounces; and it is from these latter proportions that I have determined my calculations of Spanish dollars.

### FRANCE.

Previously to the introduction of the present system of weights and measures, the appreciation of precious metals was thus effected.

That of their weights, by means of the marc divided into 8 ounces, of the ounce divided into 8 gros, of the gros divided into 3 deniers, and of the denier divided into 24 grains; the marc containing 4608 grains, and the ounce 576 grains.

In respect to their standard, the absolute purity of gold was expressed by the denomination of 24 carats; the carat being divided into 32 grains, in order to serve for the denomination of the inferior degrees of purity. The absolute purity of silver was expressed, in a similar manner, by the standard of 12 deniers, each denier being composed of 24 grains.

In consequence of the new system, of which I shall speak hereafter, the undermentioned appreciation has been substituted.

The weight of a cubic centimeter of distilled rain water, taken at the freezing point, or of the temperature of dissolving ice, has been adopted as a fundamental unit, called *gramme*; and the decimal progression of weights from such unit is denoted by the denominations *decagramme*, *hectogramme*, *kilogramme*, and *myriagramme*; while the divisions of the same weight are called *decigramme*, *centigramme*, and *milligramme*.

The National Institute of Arts and Sciences having submitted to the government, on the 4 Messidor, 7th year, a model or standard of the kilogramme, executed in platina, and determining the value of the weights now in use, in respect to those of which the use is abolished, such standard was definitively adopted by a law in date of the 19 Frimaire, 8th year. The standard itself represents  $18827\frac{3}{4}$  grains of the antient marc.



The exact comparison of the new weights with the old, establishes the following scale of equivalence.

|               | Marcs. onces. gros. grains. |    |   |           |
|---------------|-----------------------------|----|---|-----------|
| A myriagramme | =                           | 40 | 6 | 63,5      |
| A kilogramme  | =                           | 4  | 0 | 5 35,15   |
| A hectogramme | =                           |    | 3 | 2 10,715  |
| A decagramme  | =                           |    |   | 2 44,2715 |
| A gramme....  | =                           |    |   | 18,82715  |
| A decigramme  | =                           |    |   | 1,882715  |

An inverse calculation affords the undermentioned approximate scale of equivalence.

|                          | Grammes. |          |
|--------------------------|----------|----------|
| A marc, old weight, .... | =        | 244,7529 |
| An ounce.....            | =        | 30,5941  |
| A gros .....             | =        | 3,8242   |
| A denier.....            | =        | 1,2747   |
| A grain.....             | =        | 0,0531   |

According to the calculation of Newton, the ounce of England is equivalent to 1,0158 ounce of France, which, in the modern weight, would correspond with 31,0797 grammes; and, according to the assays of Tillet, to 1,0157 ounce, or 31,0765 grammes.

New denominations have also been employed to express the degrees of purity of gold and of silver. The absolute purity of both these metals is at present expressed by the standard of 1000 *millièmes*, or 1000 thousandths, that is, by an integral unit; and the fractions of that unit, also expressed in thousandths, are used to denote the respective degrees of inferior fineness.

Each carat is thus equivalent to  $41\frac{2}{3}$  millièmes, or the twenty-fourth part of 1000; and each grain, or thirty-second part of a carat, corresponds with  $1\frac{2}{3}$  millième: in like manner, each denier of fine silver is represented by  $83\frac{1}{3}$  millièmes, and each grain by  $3\frac{1}{8}$  millièmes.

The standard of gold, expressed in carats, or in grains, being multiplied by 1000, and the product divided by 24, or 768, respectively, the result will be the corresponding standard in millièmes.

The standard of silver, expressed in deniers, or in grains, being multiplied by 1000, and the product divided by 12, or by 288, respectively, the result will be the corresponding standard in millièmes.

By multiplying a number of millièmes by 24, and cutting off



from the product the three last figures, we obtain a number of carats which will correspond with the standard given; and, in like manner, by multiplying a number of milliemes by 12, and cutting off, as before, the three last figures, we obtain a corresponding number of deniers: the fractional remainder of the carats may be reduced into thirty-seconds, and that of the deniers into twenty-fourths, or into grains.

Gold and silver are sold in France with reference to the standard of absolute purity, that is to say, the weight of ingots or bars is reduced into fine by multiplying the weight by the effective standard, and dividing the product by 1000, that is, 1000 milliemes.

At the Mint at Paris, 1000 Spanish dollars, admitted to be quite new, are considered as weighing exactly 27 kilogrammes. Formerly, in several of the Provincial Mints, as well as in trade at Paris, 1000 dollars of the coinage previously to the year 1772 were received for 110 marcs weight, without any distinction in respect to their being more or less worn; and the same number of dollars of the same coinage, sent to France by the way of Bayonne and of Limoges, weighed, in fact, when received at Paris, 110 marcs 1 ounce.

#### Quotation at Paris.

Sold at, more or less.

|                           |                                    |
|---------------------------|------------------------------------|
| Gold in bars . . . . .    | 106 livres 15 sols per ounce fine  |
| Silver in bars . . . . .  | 54 livres 15 sols per marc fine    |
| Guineas and Joanes        | 97 livres 10 sols per ounce weight |
| Spanish dollars . . . . . | 5 livres 8 sols per dollar.        |

#### HAMBURG.

The weight used for the appreciation of precious metals is a marc divided into 8 ounces, or unzen, 16 loths, 256 fenings, and 4352 eschen. It is denominated *Marc of Cologne*; and, though it had the same origin as the marc properly so called (which is common to Germany in general), it is now a little heavier than the marc of Cologne, and corresponds with 3608 grains troy-weight.

In the assays, the standard of pure gold is expressed by 24 carats, and each carat, or *karate*, is divided into 12 grains, or *graen*, in order to serve for the expression of the degrees of relative purity of that metal. The standard of fine silver is ex-



pressed by 16 loths, and the degrees of inferior purity by a proportionate number of loths, each of which is divided into 18 grains.

Gold is sold by ducats of the purity of  $23\frac{1}{2}$  carats, containing, therefore, 282 grains of fine gold of the 288 which compose a marc; and the marc itself is equivalent in weight to 67 effective ducats. Thus, 47 marcs of fine gold, Cologne weight, correspond with 3216 effective ducats, and each ducat contains  $4\frac{14}{7}$  grains of fine gold of the 288 serving to denote the marc.

In respect to silver in bars, and to Spanish dollars, they are sold at so many marcs and shillings banco per marc fine; that is, their weight, inclusive of the alloy respectively, is first reduced to the actual contents of pure metal, according to the acknowledged purity of the bars or of the dollars: thus, 1000 Spanish dollars of the new coinage, weighing 115 marcs of the purity of  $\frac{14\frac{1}{3}}{16}$  loths, are reduced into fine by the following proportion:

48 : 43 :: 115 marcs weight :  $103\frac{1}{8}$  marcs fine.

Kruse says, that 1000 new dollars, which weigh 117 marcs 2 ounces in Spain, are equivalent to  $115\frac{1}{2}$  marcs, or about that quantity, Hamburg weight, denominated of Cologne; and that, admitting them to be of the purity of  $14\frac{1}{3}$  loths, corresponding with 10 pennyweights 18 grains of Spain, they contain  $103\frac{1}{16}$  marcs of fine silver. Those dollars, however, which have been in circulation, do not weigh more than  $115\frac{1}{8}$  marcs, or about that quantity; and it is asserted by Reishammer, in his *Manuel General*, page 287, printed in 1800, that 1000 dollars render at Hamburg  $103\frac{1}{8}$  marcs of fine silver of the weight there used, which agrees nearly with the weight of  $115\frac{1}{8}$  marcs gross.

The trade at Hamburg being considerable in specie and precious metals, I shall insert an explanation of the quotation of some of their prices from the works of Busch, printed in 1800.

#### Quotation at Hamburg.

Sold at, more or less.

|                                 |                                                                |
|---------------------------------|----------------------------------------------------------------|
| Gold in ingots.....             | $97\frac{1}{2}$ shillings banco per ducat $\frac{47}{8}$ fine. |
| Silver in bars.....             | 27 marcs 12 shillings banco per marc fine.                     |
| Spanish dollars ....            | 27 marcs 6 shillings banco per marc fine.                      |
| Schleswig and Holstein currency | $\frac{3}{4}$ per cent above bank money.                       |

The money here alluded to is of silver, and the same which has been current, since 1787, in the duchies of Holstein and



Schleswig:  $9\frac{1}{4}$  crowns currency make a marc of fine silver of Cologne; thus,  $9\frac{1}{4}$  crowns currency are exchanged for 27 marcs 10 shillings banco, with addition of the agio stated in the quotation.

Hamburg currency (Hamburger courant), 22.

That which we are about to consider is the current money, the par of which, in respect to bank money, is in the proportion of  $123\frac{1}{3} : 100$ . As, however, the course abovementioned, 22, denotes that the current money is at  $1\frac{1}{3}$  below par, it follows, that 122 marcs of current money are exchanged for 100 marcs banco.

Prussian currency (Preusch courant),  $54\frac{1}{2}$ .

We have now to consider of Prussian crowns, and of pieces of 8 or 4 bon gros. A marc of fine silver is equivalent to 14 Prussian crowns, each of which is worth 24 bons gros, and should be of the value of 48 shillings banco.

It is understood, by such quotation, that  $154\frac{1}{2}$  Prussian marcs or crowns are sold for 100 marcs or crowns bank money.

Denmark and Holstein currency,  $23\frac{3}{4}$ .

According to this quotation,  $123\frac{3}{4}$  marcs currency of those countries are received for 100 marcs banco.

French louis d'or... 12 marcs 7 shillings banco each.

Frederics ..... 10 marcs 10 shillings banco each.

French crowns....  $49\frac{1}{4}$  shillings banco each.

French crowns are also sold by the marc of fine silver for marcs and shillings banco.

## HOLLAND.

In the commerce of precious metals, the marc of that weight called troy-weight is adopted at Amsterdam, and in the other cities of Holland. This marc is divided into 8 ounces, the ounce into 20 engels, or estelins, and the engel into 32 as, which are again divided and subdivided into quarts, troykens, and deuskens; but the three latter are no longer in use. The marc is therefore equivalent to 5120 as, and the ounce to 640 as.

In the assays of gold, the absolute purity of that metal is expressed by the standard of 24 *karaaten*, or carats, each of which is divided into 12 *graanen*, or grains, to be indicative of the different degrees of relative fineness. In like manner, the standard of 12



*penningen*, or pennyweights, denotes the absolute purity of silver, and each pennyweight is divided into 24 grains.

In the commerce of specie, the sale is effected either by the piece, or with reference to the marc of fine silver, or to the marc with the alloy; and the price is stipulated in florins and stivers currency. The price of gold and silver in bars is stipulated in the same money, but with reference to the standard of absolute purity; that is, the quantity of each metal, inclusive of the alloy respectively, is first reduced to the actual contents of pure metal, according to the acknowledged purity of the ingots. Thus, a bar of silver weighing 16 marcs, of the purity of  $\frac{9}{12}$  pennyweights, would be reduced to 12 marcs of fine silver, by the following proportion:

12 : 9 :: 16 marcs weight : 12 marcs fine.

Spanish dollars, which since the year 1795 are sold by the dollar in stivers currency, are received at the Bank of Amsterdam under the following arrangement. They are weighed in bags of 100 marcs respectively, and to each bag, being fully of that weight, 2 dollars are added. The Bank then advances to the person who makes the deposit 2150 florins for each bag of dollars of the coinage after 1772, and 2200 florins for those of the preceding coinage; and 912 or 913 dollars are required to compose a bag of 100 marcs.

The gold coins of Portugal are received at the Bank upon the footing of 310 florins bank money for each marc gross weight.

#### Quotation.

Gold, in bars or in coins, is sold at an agio of 11 per cent, more or less, above 355 florins currency, being the price fixed by the law . . . . . per marc fine.

Silver in bars, 25 florins 15 stivers currency . . . per marc fine.

Spanish dollars, 52½ stivers currency . . . per dollar.

#### PORTUGAL.

In the appreciation of precious metals they make use of the marc, a weight which corresponds with 3542½ grains troy-weight, and which is divided into 8 onzas, 64 outavas, 192 escrúpulos, and 4608 graons or grains.

Fine gold is expressed by the standard of 24 *quilates* or carats, to which the subordinate degrees of purity are referred by a



relative number of carats, each of which is divided into 4 grains. In like manner, the standard of fine silver is fixed at 12 *dinheiros*, or pennyweights; and the subdivision of the pennyweight, adopted for the expression of the subordinate degrees of purity, is that of 24 grains.

Gold, in bars, is sold in Portugal by the *outava*, at a price either relative to the purity of gold in coin, which is that of 22 carats, or to the purity of gold dust, which is that of  $21\frac{3}{4}$  to 22 carats; or, lastly, to the purity of effective ingots.

Silver, in bars, is sold by the ounce, at a price either relative to the standard of absolute purity, or to that of the wrought silver, which is fixed at  $10\frac{1}{4}$  pennyweights.

The exportation both of gold and silver in bars, and of the coins of the country in those metals, is prohibited; but it is, nevertheless, so considerable, being an indispensable means of commerce in respect to Portugal, that it would be the interest of the government to permit the exportation upon payment of a duty sufficient to be considered as a source of revenue, and, at the same time, not of that magnitude which would encourage illicit traffic in this business.

Spanish dollars are sold in Portugal by the marc, but more generally by the dollar. The importation of this coin from the frontiers of Spain is very considerable.

### SPAIN.

In weighing precious metals, a marc is used, having several denominations, but which is best known under that of Marco Castellano, or Marc of Castille: it is equivalent to 3550 $\frac{2}{3}$  grains troy-weight, and is divided as follows:

In respect to gold, into 8 onzas or ounces, 50 castellanos, 64 ochavas, 128 adarmes, 400 tomines, and 4800 granos or grains.

In respect to silver, into 8 ounces, 50 castellanos, 64 ochavas, 128 adarmes, 384 tomines, and 4608 grains.

In some provinces, however, either a weight differing from that of Castille is used, or the same weight is differently divided.

In Catalonia, the marc is equivalent to  $1\frac{1}{6}$  marc of Castille; so that 7 marcs of Castille are equal to 6 of Catalonia, each of which is divided into 8 ounces, 32 quartos, and 128 argiensos or adarmes. The argienso weighs 36 granos; so that the 4608 grains, com-



posing the marc of Catalonia, correspond to 5376 grains of Castille.

In the titular kingdom of Valencia they make use of a marc which is heavier than that of Castille, in the proportion of 16 to 15½: thus, 32 marcs of Castille are equal to 31 marcs of Valencia, and each of the latter is divided in the same manner as the marc of Catalonia.

In Arragon, the marc is the same as that of Castille, but it is divided into 8 ounces, 32 quartos, 128 adarmes, and 4096 grains.

The standard of fine gold is, throughout Spain, 24 *quilates* or carats; the carat is divided into 4 grains, and each grain into 8 parts, having no specific denomination in order to serve for the expression of the relative degrees of fineness of that metal.

The standard of fine silver is 12 dineros or pennyweights, each of which is divided into 24 grains for the same purpose.

Gold is sold, in Spain, by the *castellano*, and the price, which is stipulated in reals of plate, is understood to be as for gold at 22 carats and a half. The price of silver in bars is also in reals of plate, by the marc fine of Castille.

The duty payable to the King of Spain upon dollars exported from his European dominions was fixed, in 1750, at 3 per cent, and in 1768 it was augmented to 4 per cent. The exportation has been since made a matter of privilege granted in 1794 to the Bank of St. Charles, at Madrid, in favour of which, the duty was increased to 4½ per cent: by subsequent regulations, however, it appears that there has been still another augmentation, for, in 1804, the dollars which were exported from Cadiz to London paid a duty of 1323 reals 23 maravedis of vellon per bag of 1000 dollars, which is about 6¾ per cent.

The exportation both of gold and silver in ingots is prohibited without the king's license, the policy of which, however, as well as of the duty levied upon the exportation of dollars, is very questionable. In fact, as the exportation of specie or bullion is an indispensable means of commerce in respect to Spain, the conband conveyance of dollars from that country to Portugal is immense, and, even at Cadiz, the shipments are at once considerable and regularly conducted; the risk of this illicit traffic being actually calculated at no more than 2 per cent. It would, therefore, be the interest of his Catholic Majesty to permit the free exportation both of bullion and specie at a duty of 2 per cent,



whence the state would receive, as a revenue, what is now the price of the violation of its regulations, and, in its effects, a tax to the same or greater extent upon commerce.

### OF THE CALCULATION OF GOLD AND SILVER IN SPECIE AND IN BULLION.

AFTER having treated of the several modes of sale of precious metals, and of the relation of the weights employed in this branch of business, I have now to speak of the calculations in use in accompting-houses. In order to effect the calculations referred to, it is necessary to have a preliminary knowledge of the relation of weights, of the difference between the respective standards, and of the conditions upon which the metals are sold, and then to determine, by a rule of equation, according to the quotations of prices received from abroad, and with reference to the supposed amount of charges, either the price which an ounce, a marc, or any other given quantity, may cost, or the rate of exchange which the sale may establish between the two contracting places. It is obvious that such results may be obtained as well by simulate as by real accounts; but such accounts are not always to be procured, and the operations which are the consequence of them are of themselves much longer than those performed by a rule of equation.

It is expedient, however, to point out that the results are the same by both calculations; and, with this view, I shall describe an operation founded upon real accounts of the present year, which cannot fail of proving interesting, as it comprises the mode of payment at present adopted in Portugal, which is but little known in this country.

#### INVOICE from LISBON, March 7, 1805.

|                                                                                                      | Reis.          |
|------------------------------------------------------------------------------------------------------|----------------|
| 150 meyas dobras, or Joanese, at reis 6400 .....                                                     | 960000         |
| Premium $\frac{1}{2}$ per cent for the selection of pieces (the least worn) .....                    | 40800          |
| Freight $\frac{1}{2}$ per cent.....                                                                  | 40800          |
|                                                                                                      | <hr/>          |
|                                                                                                      | 969600         |
| For the reduction of 969600 reis effective money into reis legal money, at 12 per cent discount..... | 610890         |
|                                                                                                      | <hr/>          |
| <b>Total.....</b>                                                                                    | <b>1031490</b> |



## ACCOUNT of SALES at LONDON, April 3, 1805.

## Sale.

150 Joaneses, weighed <sup>oz. dwt. grs.</sup> 69 1 21 at £4 ..... £276 7 6

## Charges.

|                                                         |              |
|---------------------------------------------------------|--------------|
| Insurance on £280, at 2 guineas per cent...             | £5 17 7      |
| Policy, $\frac{1}{4}$ per cent on £300.....             | 0 15 0       |
| Commission, $\frac{1}{2}$ per cent on £280.....         | 1 8 0        |
| Carriage from Falmouth, at 4 shillings per<br>£100..... | 0 11 0       |
| Petty charges.....                                      | 0 0 9        |
| Commission, $\frac{1}{2}$ per cent on £276 7 6.....     | 1 7 8        |
|                                                         | <hr/> 10 0 0 |
| Net proceeds.....                                       | £266 7 6     |

In order now to discover the course of exchange which this sale establishes between Lisbon and London, it is necessary to reduce £266 7 6 into pence, and to state the following proportion :

10310490 reis : 63930 pence :: 1000 reis :  $x$ ,

the result of which is 62; and, as Lisbon drew upon London at 61, the profit resulting from the operation was in the proportion of 61 to 62.

It will be observed, that as Lisbon transmitted effective money, and received the amount of its drafts upon London in legal money, the invoice of the purchase is of course inclusive of the discount of 12 per cent upon half the payment in paper money; such discount being computed according to the calculation which I have exemplified in p. 94. It will be also observed, that 150 Joaneses, weighing 69 oz 1 dwt 21 grains, establish the proportional equivalence of 400 Joaneses to  $184\frac{1}{4}$  ounces troy-weight; and, lastly, that the aggregate of the charges at Lisbon and at London amounts to  $4\frac{3}{4}$  per cent. From these particulars, I shall deduce the same result by the following rule of equation.

## PROPOSITION.

A quantity of Joaneses was purchased at Lisbon while the discount upon paper money was at 12 per cent, and remitted to London, where it was sold at the rate of £4 sterling per ounce. Required the course of exchange between the two places, resulting from the sale; the aggregate charges being  $4\frac{3}{4}$  per cent.

## Equation.

|                             |                                    |
|-----------------------------|------------------------------------|
|                             | 1000 reis legal money = $x$        |
| 100 reis legal money =      | 94 reis effective money            |
| 6400 reis effective money = | 1 Joaneses                         |
| 400 Joaneses =              | $184\frac{1}{4}$ ounces of England |
| 1 ounce =                   | 4 pounds sterling                  |
| 1 pound sterling =          | 240 pence sterling                 |
| $104\frac{3}{4}$            | = 100 with charges.                |



In this equation I have placed 1000 reis, being the certain price of the exchange, as the first term of the dividend, since the object of the operation is that of ascertaining the rate of exchange between Lisbon and London. I have effected the general reduction of the legal money into effective, by opposing 100 to 100 minus 6, being half the discount; and, lastly, I have placed the charges in the divisor, by opposing  $104\frac{3}{4}$  to 100; for, as the result of the operation, or the eventual rate of exchange, will be profitable in proportion as it may be numerically higher, the charges are to be deducted.

The equation being thus arranged, I shall abridge the calculation, as follows:

$$\begin{array}{rcl}
 & & 1000 \\
 4 \text{ } 32 & 100 = & 64 \text{ } 47 \\
 & 400 = & 1 \\
 & 400 = & 184\frac{1}{4} \\
 & 1 = & 4 \\
 & 1 = & 74 \text{ } 3 \\
 & 104\frac{3}{4} = & 100
 \end{array}$$

First, I reject 6 ciphers in each column, and then the two similar numbers, 4 pounds and 4 Joaneses; the latter being the remainder of the 400 Joaneses after the suppression of the ciphers. I divide each of the numbers 64 and 94 by 2, which gives the quotients 32 and 47; and then I divide the quotient 32 and the number 24 each by 8, which gives the quotients 4 and 3; whence the divisor and dividend are reduced to the following numbers:

| Divisor.         | Dividend.        |
|------------------|------------------|
| 4                | 47               |
| $104\frac{3}{4}$ | $184\frac{1}{4}$ |
|                  | 3                |

Proceeding to effect the operation, I find the result to be 62, being the same as that which I had obtained by the comparison of the accounts of purchase and sale.

It is to be observed, however, that the equations which result from the analysis of various propositions are not always susceptible of a similar abridgment: there are even several which have scarcely any such susceptibility, and, in particular, the operations between Amsterdam and London, Hamburg and London.

It is for this reason that logarithms are applied to calculations of gold and silver, specie and bullion; and so great is the simplification introduced by their use, that all the logarithms of the invariable numbers of each equation are reduced to a single fixed



logarithm to be employed with the logarithms of the variable numbers. In following this method, I have pointed out at the end of each equation the variable numbers, and determined the fixed logarithm to be employed.

In order to demonstrate the great advantage derived from the use of logarithms in similar calculations, I shall now insert another real operation.

## PROPOSITION.

Hamburg orders Lisbon to purchase a quantity of Spanish dollars at 850 reis per dollar, and to forward the same quantity to London, drawing upon Hamburg for the amount. Lisbon effects the purchase, and draws upon Hamburg at  $43\frac{7}{8}$ , at 90 days' date. London sells the dollars at 66 pence sterling per ounce, and remits the proceeds to Hamburg in direct remittances at 35 8, payable at  $2\frac{1}{2}$  usances. The charges at Lisbon and at London amount to  $5\frac{7}{16}$  per cent, and the interest of the funds employed by Hamburg in the interval between the payment of the drafts from Lisbon, and the receipt of the amount of the remittances from London, is equivalent to  $\frac{1}{2}$  per cent. Required to find the price of the dollars per ounce at London, either inclusive or exclusive of the charges, and also the rate per cent of profit which Hamburg derives from the operation.

The object of this calculation being that of finding the price of an ounce, I state 1 ounce as the first term of the following equation :

|                                   |   |                        |
|-----------------------------------|---|------------------------|
|                                   |   | 1 ounce                |
| 865 ounces                        | = | 1000 dollars           |
| 1 dollar                          | = | 850 reis               |
| 400 reis                          | = | $43\frac{7}{8}$ grotes |
| 12 grotes                         | = | 1 shilling Flemish     |
| $35\frac{2}{3}$ shillings Flemish | = | 1 pound sterling       |
| 1 pound sterling                  | = | 240 pence sterling.    |

Upon examination of this equation, I perceive that the variable numbers are 850 reis, the cost of a dollar at Lisbon ;  $43\frac{7}{8}$  grotes, the course of exchange between Lisbon and Hamburg ; and  $35\frac{2}{3}$  shillings Flemish, the course of exchange at London upon Hamburg. Hence, after adding the logarithm corresponding to the other numbers in each column, which are invariable, I deduct the sum of the logarithms of the dividend from the sum of the logarithms of the divisor, and obtain 123805 as a fixed logarithm, to be employed in the present and in any similar operation. I



have, therefore, now to combine this fixed logarithm with the logarithms of the variable numbers abovementioned, subjoining to the operation the amount of the charges and of the interest, making  $5\frac{1}{8}$  per cent; and also the price of 66 pence per ounce, at which the dollars were sold, and by which I shall discover the per centage of profit.

*Solution by Logarithms.*

|                           |                 |   |                                |
|---------------------------|-----------------|---|--------------------------------|
| Price at Lisbon.....      | 850             | = | 292942                         |
| Lisbon on Hamburg....     | $43\frac{7}{8}$ | + | 164222                         |
|                           |                 |   | <hr/>                          |
|                           |                 |   | 457164                         |
| London on Hamburg...      | 35 8            | — | 155226                         |
|                           |                 |   | <hr/>                          |
|                           |                 |   | 301938                         |
| Fixed logarithm.....      |                 | — | 123805                         |
|                           |                 |   | <hr/>                          |
|                           |                 |   | 178133 = $60\frac{7}{8}$ pence |
| Charges and interest....  | $5\frac{1}{8}$  | + | 2505                           |
|                           |                 |   | <hr/>                          |
|                           |                 |   | 180638 = $64\frac{1}{2}$ pence |
| Rate per cent of profit.. | $3\frac{1}{8}$  | + | 1316                           |
|                           |                 |   | <hr/>                          |
|                           |                 |   | 181954 = 66 pence.             |

In the operation just stated, after having added the logarithms of the numbers 850 and  $43\frac{7}{8}$ , which are in the dividend, I have deducted successively the logarithm of the number 35 8, which is in the divisor, and the fixed logarithm appertaining to the latter. The logarithm 178133, which remains after such subtractions, corresponds in the table to the number  $60\frac{7}{8}$ , which denotes the price per ounce, and without the charges, of the dollars at London. Proceeding to add, according to the rule given in p. 192, the same logarithm to the logarithm of  $5\frac{1}{8}$ , being the amount of the charges and of the interest, I have obtained the logarithm 180638, corresponding to the number  $64\frac{1}{2}$ , which denotes the price of an ounce of the dollars at London, with the charges. Looking now to the table for the logarithm of 66, being the rate of sale of an ounce of dollars at London, the difference between 181954, logarithm of 66, and 180638, logarithm of  $64\frac{1}{2}$ , is 1316, which, being added to 200000, the logarithm of 100, gives a logarithm of 201316, which, by its correspondence in the table to the natural number  $103\frac{1}{8}$ , denotes that the profit resulting from the operation is at the rate of  $3\frac{1}{8}$  per cent.



Such, then, is the effect of the admirable invention of logarithms, that, by applying them to the calculations of commerce, they present a faithful representation of operations, which may be reduced, extended, or proved, with the greatest facility.

In respect to adding or deducting the charges, I shall confine myself to saying, that, whenever the price of an ounce be required, the charges must be added to the simple result, since it is evident that they necessarily increase the price at which the ounce stands in; and that, when it be required to find the rate of exchange, the charges must be added, if the place where the calculation is made give the certain price, and deducted if the same place give the uncertain price. In fact, in the former case, the result will be advantageous in proportion as it may be numerically low; and in the second, it will be advantageous in proportion as it may be numerically high.

Calculations of gold and silver specie and bullion are proved, either by determining an inverse equation, or by finding the course of exchange when the price of an ounce has been obtained, or the price of an ounce when the course of exchange has been obtained.

## EXAMPLE.

Required the price at London of an ounce of Spanish dollars bought at Lisbon at 859 reis per dollar; the course of exchange of Lisbon on London being at 63, and the aggregate charges 3 per cent.

|                  |   |                                  |
|------------------|---|----------------------------------|
| <i>Equation.</i> |   | 1 ounce = $64\frac{7}{16}$ pence |
| 865 ounces       | = | 1000 dollars                     |
| 1 dollar         | = | 859 reis                         |
| 1000 reis        | = | 63 pence                         |
| 100 with charges | = | 103.                             |

*Proof.*

Required the course of exchange between Lisbon and London resulting from the sale at London, at  $64\frac{7}{16}$  pence, of an ounce of dollars bought at Lisbon at 859 reis per dollar, the charges amounting to 3 per cent.

|                  |   |                        |
|------------------|---|------------------------|
| <i>Equation.</i> |   | 1000 reis = 63 pence   |
| 859 reis         | = | 1 dollar               |
| 1000 dollars     | = | 865 ounces             |
| 1 ounce          | = | $64\frac{7}{16}$ pence |
| 103              | = | 100 with charges.      |



By inserting in the proof the price of an ounce, as obtained by the first equation, it is evident that the second equation must reproduce the course of exchange inserted in the first equation, and *vice versa*.

### LONDON.

#### *Proportion of certain Weights.*

|                        |   |                            |
|------------------------|---|----------------------------|
| 12 oz standard gold    | = | 11 ounces fine gold        |
| 40 oz standard silver  | = | 37 ounces fine silver      |
| 215 oz standard silver | = | 222 ounces new dollars     |
| 43 oz fine silver      | = | 48 ounces new dollars      |
| 175 lbs troy weight    | = | 144 lbs avoirdupois weight |

|                          |   |                              |
|--------------------------|---|------------------------------|
| 63 oz of England.....    | = | 64 ounces of France          |
| 63 ditto.....            | = | 8 marcs of France            |
| 3218 ditto.....          | = | 100 kilogrammes of France    |
| 451 ditto.....           | = | 60 marcs of Hamburg          |
| 633 ditto.....           | = | 80 marcs of Holland          |
| 369 ditto.....           | = | 50 marcs of Portugal         |
| 37 ditto.....            | = | 5 marcs of Spain             |
| 37 ditto.....            | = | 250 castellanos of Spain     |
| 273 oz standard gold.... | = | 34 marcs ducat gold of Hamb. |
| 65 oz standard silver... | = | 8 marcs fine silver of Hamb. |

|                           |   |                          |
|---------------------------|---|--------------------------|
| 1000 doubloons, quite new | = | 868 ounces of England    |
| 400 Joaneses, quite new   | = | 185 ounces of England    |
|                           | = | 867½ ounces of England   |
|                           | = | 110½ marcs of France     |
|                           | = | 27 kilogrammes of France |
| 1000 dollars, quite new   | = | 115½ marcs of Hamburg    |
|                           | = | 109½ marcs of Holland    |
|                           | = | 117½ marcs of Portugal   |
|                           | = | 117½ marcs of Spain.     |



## LONDON AND FRANCE.

## GOLD in BARS imported.

Required the price in London of an ounce standard of gold in bars, bought at Paris at 106 livres 15 sols tournois per ounce fine, the course of exchange being at 24 4.

|                                 |   |                                  |
|---------------------------------|---|----------------------------------|
| <i>Equation.</i>                | = | 1 ounce standard = $x$           |
| 12 ounces standard              | = | 11 ounces fine                   |
| 63 ounces of England            | = | 64 ounces of France              |
| 1 ounce fine                    | = | $106\frac{3}{4}$ livres tournois |
| $24\frac{1}{2}$ livres tournois | = | 20 shillings sterling.           |

Standard gold is reduced into fine gold by opposing 12 to 11, and the result of the equation is in shillings sterling. The only variable numbers are the price of gold at Paris, and the course of exchange.

|                                      |                                        |
|--------------------------------------|----------------------------------------|
| <i>Solution by Logarithms.</i>       | 127008 fixed logarithm                 |
| Price at Paris..... $106\frac{3}{4}$ | + 202837                               |
|                                      | <hr/> 329845                           |
| Course of exchange 24 4              | — 138382                               |
|                                      | <hr/> 191463 = $82\frac{5}{8}$ result. |

N. B. The charges are to be added.

## LONDON AND FRANCE.

## GOLD in BARS exported.

Required the price at Paris of an ounce fine of gold in bars, bought in London at 3 pounds 19 shillings sterling per ounce standard, the course of exchange of London on Paris being at 24 6.

|                       |                                     |
|-----------------------|-------------------------------------|
| <i>Equation.</i>      | 1 ounce fine = $x$                  |
| 64 ounces of France   | = 63 ounces of England              |
| 11 ounces fine        | = 12 ounces standard                |
| 1 ounce standard      | = 79 shillings sterling             |
| 20 shillings sterling | = $24\frac{3}{10}$ livres tournois. |

Fine gold is reduced into standard gold by opposing 11 to 12, and the result of the equation is in livres tournois. The only variable numbers are the price of gold in London, and the course of exchange.

*Solution by Logarithms.*

|                         |    |              |        |
|-------------------------|----|--------------|--------|
| Price in London         | 79 | =            | 189763 |
| Course of exchange 24 6 | +  | 138561       |        |
|                         |    | <hr/> 328324 |        |
| Fixed logarithm .....   | —  | 127008       |        |

$$201316 = 103\frac{1}{10} \text{ result.}$$

N. B. Reduce the price of gold at London into shillings, and add the charges.



## LONDON AND FRANCE.

## GOLD in BARS.

Required the course of exchange between London and Paris resulting from the sale in London, at 4 pounds 1 shilling 3 pence sterling, of an ounce standard of gold in bars, bought at Paris at 105 livres 17 sols 6 deniers tournois per ounce fine.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 20 \text{ shillings sterling} \\
 81\frac{1}{4} \text{ shillings sterling} & = & 1 \text{ ounce standard} \\
 12 \text{ ounces standard} & = & 11 \text{ ounces fine} \\
 63 \text{ ounces of England} & = & 64 \text{ ounces of France} \\
 1 \text{ ounce fine} & = & 105\frac{1}{8} \text{ livres tournois.}
 \end{array}$$

Standard gold is reduced into fine gold by opposing 12 to 11, and the result of the equation is in livres and sols tournois. The only variable numbers are the price of gold either at Paris or in London.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 127008 \text{ fixed logarithm} \\
 \text{Price at Paris} \dots\dots\dots 105\frac{1}{8} & + & 202479
 \end{array}$$

---

 329487

$$\begin{array}{rcl}
 \text{Price in London} \dots\dots\dots 81\frac{1}{4} & - & 190982
 \end{array}$$

---

 138505 = 24 5½ result.

N. B. Reduce the price of gold at London into shillings, and add the charges.

This operation to find the course of exchange is the same, whether the gold in bars be imported or exported.

## LONDON AND FRANCE.

## SILVER in BARS imported.

Required the price in London of an ounce standard of silver in bars, bought at Paris at 54 livres 5 sols tournois per marc fine, the course of exchange of Paris on London being at 25 6.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ ounce standard} = x \\
 40 \text{ ounces standard} & = & 37 \text{ ounces fine} \\
 63 \text{ ounces of England} & = & 8 \text{ marcs of France} \\
 1 \text{ marc fine} & = & 54\frac{1}{4} \text{ livres tournois} \\
 25\frac{3}{10} \text{ livres tournois} & = & 240 \text{ pence sterling.}
 \end{array}$$

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in pence sterling. The only variable numbers are the price of silver at Paris, and the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 145010 \text{ fixed logarithm} \\
 \text{Price at Paris} \dots\dots\dots 54\frac{1}{4} & + & 173440
 \end{array}$$

---

 318450

$$\begin{array}{rcl}
 \text{Course of exchange} \dots 25 \ 6 & - & 140312
 \end{array}$$

---

 178138 = 60½ result.

N. B. The charges are to be added.



## LONDON AND FRANCE.

## SILVER in BARS exported.

Required the price at Paris of a marc fine of silver in bars, bought in London at 5 shillings 2 pence sterling per ounce standard, the course of exchange of London on Paris being at 24 8.

*Equation.*

$$\begin{aligned}
 1 \text{ marc fine} &= x \\
 8 \text{ marcs of France} &= 63 \text{ ounces of England} \\
 37 \text{ ounces fine} &= 40 \text{ ounces standard} \\
 1 \text{ ounce standard} &= 62 \text{ pence sterling} \\
 240 \text{ pence sterling} &= 24\frac{2}{3} \text{ livres tournois.}
 \end{aligned}$$

Fine silver is reduced into standard silver by opposing 37 to 40, and the result of the equation is in livres tournois. The only variable numbers are the price of silver in London, and the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 \text{Price in London} & \dots\dots 62 & = 179239 \\
 \text{Course of exchange} & \dots 24 \ 8 & + 138739
 \end{array}$$

$$\begin{array}{rcl}
 & & 317978 \\
 \text{Fixed logarithm} & \dots\dots\dots & - 145010
 \end{array}$$

$$172968 = 53\frac{2}{3} \text{ result.}$$

N. B. Reduce the price of silver at London into pence, and add the charges.

## LONDON AND FRANCE.

## SILVER in BARS.

Required the course of exchange between London and Paris, resulting from the sale in London, at 5 shillings 8½ pence sterling, of an ounce standard of silver in bars, bought at Paris at 54 livres 10 sols tournois per marc fine.

*Equation.*

$$\begin{aligned}
 1 \text{ pound sterling} &= x \\
 1 \text{ pound sterling} &= 240 \text{ pence sterling} \\
 68\frac{1}{2} \text{ pence sterling} &= 1 \text{ ounce standard} \\
 40 \text{ ounces standard} &= 37 \text{ ounces fine} \\
 63 \text{ ounces of England} &= 8 \text{ marcs of France} \\
 1 \text{ marc fine} &= 54\frac{1}{2} \text{ livres tournois.}
 \end{aligned}$$

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in livres and sols tournois. The only variable numbers are the price of silver either at Paris or in London.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 145010 \text{ fixed logarithm} \\
 \text{Price at Paris} & \dots\dots\dots 54\frac{1}{2} & + 173640
 \end{array}$$

$$\begin{array}{rcl}
 & & 318650 \\
 \text{Price in London} & \dots\dots\dots 68\frac{1}{2} & - 183569
 \end{array}$$

$$135081 = 22 \ 8\frac{7}{12} \text{ result.}$$

N. B. Reduce the price of silver at London into pence, and add the charges.—This operation to find the course of exchange is the same, whether the silver in bars be imported or exported.



## LONDON AND FRANCE.

## SPANISH DOLLARS imported.

Required the price in London of an ounce of new dollars, bought at Paris at 5 livres 7 sols 9 deniers tournois per dollar, the course of exchange of Paris on London being at 23 18.

*Equation.*

|                                   |   |                                 |
|-----------------------------------|---|---------------------------------|
| 1 ounce                           | = | $x$                             |
| 865 ounces                        | = | 1000 dollars                    |
| 1 dollar                          | = | 107 $\frac{3}{4}$ sols tournois |
| 20 sols tournois                  | = | 1 livre tournois                |
| 23 $\frac{9}{16}$ livres tournois | = | 240 pence sterling.             |

The result of the equation is in pence sterling, and the only variable numbers are the price of dollars at Paris, and the course of exchange.

*Solution by Logarithms.*

|                      |                   |   |        |
|----------------------|-------------------|---|--------|
| Price at Paris ..... | 107 $\frac{3}{4}$ | = | 203242 |
|----------------------|-------------------|---|--------|

|                       |       |   |        |
|-----------------------|-------|---|--------|
| Course of exchange .. | 23 18 | — | 137840 |
|-----------------------|-------|---|--------|

|  |  |  |                                   |
|--|--|--|-----------------------------------|
|  |  |  | 179618 = 62 $\frac{1}{2}$ result. |
|--|--|--|-----------------------------------|

N. B. Reduce the price of a dollar at Paris into sols tournois, and add the charges.

## LONDON AND FRANCE.

## SPANISH DOLLARS exported.

Required the price at Paris of new dollars bought in London at 5 shillings 1 penny per ounce, the course of exchange of London on Paris being at 24 2.

*Equation.*

|                    |   |                                   |
|--------------------|---|-----------------------------------|
| 1 dollar           | = | $x$                               |
| 1000 dollars       | = | 865 ounces                        |
| 1 ounce            | = | 61 pence sterling                 |
| 240 pence sterling | = | 24 $\frac{1}{10}$ livres tournois |
| 1 livre tournois   | = | 20 sols tournois.                 |

The result of the equation is in sols tournois per dollar, and the only variable numbers are the price of dollars in London, and the course of exchange.

*Solution by Logarithms.*

|                       |    |   |        |
|-----------------------|----|---|--------|
| Price in London ..... | 61 | = | 178533 |
|-----------------------|----|---|--------|

|                        |      |   |        |
|------------------------|------|---|--------|
| Course of exchange ... | 24 2 | + | 138202 |
|------------------------|------|---|--------|

|                       |  |   |        |
|-----------------------|--|---|--------|
| Fixed logarithm ..... |  | — | 114216 |
|-----------------------|--|---|--------|

|  |  |  |                                    |
|--|--|--|------------------------------------|
|  |  |  | 202519 = 105 $\frac{1}{2}$ result. |
|--|--|--|------------------------------------|

N. B. Reduce the price of dollars at London into pence, and add the charges.



## LONDON AND FRANCE.

## SPANISH DOLLARS.

Required the course of exchange between London and Paris resulting from the sale in London, at 5 shillings 7 pence sterling, of an ounce of new dollars, bought at Paris at 5 livres 8 sols 3 deniers tournois per dollar.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling} \\
 67 \text{ pence sterling} & = & 1 \text{ ounce} \\
 365 \text{ ounces} & = & 1000 \text{ dollars} \\
 1 \text{ dollar} & = & 108\frac{1}{4} \text{ sols tournois} \\
 20 \text{ sols tournois} & = & 1 \text{ livre tournois.}
 \end{array}$$

The result of the equation is in livres and sols tournois, and the only variable numbers are the price of dollars either at Paris or in London.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 114216 \text{ fixed logarithm} \\
 \text{Price at Paris} \dots\dots\dots 108\frac{1}{4} & + & 203443 \\
 & & \hline
 \text{Price in London} \dots\dots\dots 67 & - & 182607 \\
 & & \hline
 \end{array}$$

$$135052 = 22 \text{ } 8\frac{1}{2} \text{ result.}$$

N. B. Reduce the price of dollars at London into pence, and add the charges.

This operation to find the course of exchange is the same, whether the Spanish dollars be imported or exported.

## LONDON AND FRANCE.

## GUINEAS.

Required the price at Paris of an ounce of guineas remitted from London, the course of exchange of London on Paris being at 23 15.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ ounce} = x \\
 64 \text{ ounces of France} & = & 63 \text{ ounces of England} \\
 1 \text{ ounce} & = & 480 \text{ grains} \\
 128 \text{ grains} & = & 1 \text{ guinea} \\
 20 \text{ guineas} & = & 21 \text{ pounds sterling} \\
 1 \text{ pound sterling} & = & 23\frac{3}{4} \text{ livres tournois.}
 \end{array}$$

The result of the equation is in livres tournois, and the only variable number is the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 58838 \text{ fixed logarithm} \\
 \text{Course of exchange} \dots 23 \text{ } 15 & + & 137566 \\
 & & \hline
 \end{array}$$

$$196404 = 92\frac{1}{6} \text{ result.}$$

N. B. The charges are to be added.



## LONDON AND FRANCE.

## GUINEAS.

Required the course of exchange between London and Paris resulting from the sale at Paris, at 97 livres 7 sols 6 deniers tournois, of an ounce of guineas remitted from London.

*Equation.*

$$\begin{aligned}
 &1 \text{ pound sterling} = x \\
 &21 \text{ pounds sterling} = 20 \text{ guineas} \\
 &1 \text{ guinea} = 128 \text{ grains} \\
 &480 \text{ grains} = 1 \text{ ounce} \\
 &63 \text{ ounces of England} = 64 \text{ ounces of France} \\
 &1 \text{ ounce of guineas} = 97\frac{3}{8} \text{ livres tournois.}
 \end{aligned}$$

The result of the equation is in livres and sols tournois, and the only variable number is the price of guineas at Paris.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 \text{Price at Paris} & \dots\dots\dots & 97\frac{3}{8} = 198845 \\
 \text{Fixed logarithm} & \dots\dots\dots & - \quad 58838 \\
 \hline
 & & 140007 = 25 \text{ } 2\frac{1}{2} \text{ result.}
 \end{array}$$

N. B. The charges are to be added.

## LONDON AND HAMBURG.

## GOLD in BARS imported.

Required the price in London of an ounce standard of gold in bars, bought at Hamburg at 98 shillings banco per ducat  $\frac{23\frac{1}{2}}{24}$  carats fine, the course of exchange of Hamburg on London being at 34 2.

*Equation.*

$$\begin{aligned}
 &1 \text{ ounce standard} = x \\
 &451 \text{ ounces of England} = 60 \text{ marcs of Hamburg} \\
 &47 \text{ marcs } \frac{4\frac{1}{8}}{8} \text{ fine} = 44 \text{ marcs } \frac{4\frac{1}{8}}{8} \text{ fine} \\
 &1 \text{ marc} = 67 \text{ ducats} \\
 &1 \text{ ducat} = 98 \text{ shillings banco} \\
 &6 \text{ shillings banco} = 1 \text{ shilling Flemish} \\
 &34\frac{1}{2} \text{ shillings Flemish} = 20 \text{ shillings sterling.}
 \end{aligned}$$

Standard gold is reduced into ducat gold by opposing 47 to 44, and the result of the equation is in shillings sterling. The only variable numbers are the price of gold at Hamburg, and the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 144427 \text{ fixed logarithm} \\
 \text{Price at Hamburg} & \dots\dots & 98 + 199123 \\
 \hline
 & & 343550 \\
 \text{Course of exchange} & \dots\dots & 34\frac{1}{2} - 153360 \\
 \hline
 & & 190190 = 79\frac{3}{4} \text{ result.}
 \end{array}$$

N. B. The charges are to be added.



## LONDON AND HAMBURG.

GOLD in BARS exported.

Required the price at Hamburg of a ducat  $\frac{23\frac{1}{2}}{24}$  carats fine of gold in bars, bought in London at 3 pounds 19 shillings 11 pence sterling per ounce standard, the course of exchange of London on Hamburg being at 34 3.

*Equation.*

|                                |   |                                      |
|--------------------------------|---|--------------------------------------|
|                                | = | 1 ducat = $x$                        |
| 67 ducats                      | = | 1 marc                               |
| 60 marcs of Hamburg            | = | 451 ounces of England                |
| 44 ounces $\frac{47}{48}$ fine | = | 47 ounces $\frac{47}{48}$ fine       |
| 1 ounce standard               | = | 79 $\frac{11}{2}$ shillings sterling |
| 20 shillings sterling          | = | 34 $\frac{1}{4}$ shillings Flemish   |
| 1 shilling Flemish             | = | 6 shillings banco.                   |

Ducat gold is reduced into standard gold by opposing 44 to 47, and the result of the equation is in shillings banco. The only variable numbers are the price of gold in London, and the course of exchange.

*Solution by Logarithms.*

|                    |       |                   |        |                                          |
|--------------------|-------|-------------------|--------|------------------------------------------|
| Price in London    | ..... | 79 $\frac{11}{2}$ | =      | 190264                                   |
| Course of exchange | ..    | 34 $\frac{1}{4}$  | +      | 153466                                   |
|                    |       |                   |        | <u>343730</u>                            |
| Fixed logarithm    | ..... | —                 | 144427 |                                          |
|                    |       |                   |        | <u>199303</u> = 98 $\frac{1}{3}$ result. |

N. B. Reduce the price of gold at London into shillings, and add the charges.

## LONDON AND HAMBURG.

GOLD in BARS.

Required the course of exchange between London and Hamburg resulting from the sale in London, at 4 pounds 1 shilling sterling, of an ounce standard of gold in bars bought at Hamburg at 96  $\frac{3}{8}$  shillings banco per ducat  $\frac{23\frac{1}{2}}{24}$  carats fine.

*Equation.*

|                               |   |                                  |
|-------------------------------|---|----------------------------------|
|                               | = | 1 pound sterling = $x$           |
| 1 pound sterling              | = | 20 shillings sterling            |
| 81 shillings sterling         | = | 1 ounce standard                 |
| 451 ounces of England         | = | 60 marcs of Hamburg              |
| 47 marcs $\frac{47}{48}$ fine | = | 44 marcs $\frac{47}{48}$ fine    |
| 1 marc                        | = | 67 ducats                        |
| 1 ducat                       | = | 96 $\frac{3}{8}$ shillings banco |
| 6 shillings banco             | = | 1 shilling Flemish.              |

Standard gold is reduced into ducat gold by opposing 47 to 44, and the result of the equation is in shillings and grotes Flemish banco. The only variable numbers are the price of gold either at Hamburg or in London.

*Solution by Logarithms.*

|                       |                 |        |                 |
|-----------------------|-----------------|--------|-----------------|
|                       |                 | 144427 | fixed logarithm |
| Price at Hamburg..... | $96\frac{3}{8}$ | +      | 198396          |
|                       |                 |        | <u>342823</u>   |
| Price in London ..... | 81              | —      | 190849          |
|                       |                 |        | <u>151974</u>   |
|                       |                 |        | = 33 1 result.  |

N. B. Reduce the price of gold at London into shillings, and add the charges.

This operation to find the course of exchange is the same, whether the gold in bars be imported or exported.



## LONDON AND HAMBURG.

SILVER in BARS imported.

Required the price in London of an ounce standard of silver in bars, bought at Hamburg at 27 marcs 12 shillings banco per marc fine, the course of exchange of Hamburg on London being at 33 11.

*Equation.*

$$\begin{aligned}
 &1 \text{ ounce standard} = x \\
 &40 \text{ ounces standard} = 37 \text{ ounces fine} \\
 &451 \text{ ounces of England} = 60 \text{ marcs of Hamburg} \\
 &1 \text{ marc fine} = 27\frac{3}{4} \text{ marcs banco} \\
 &3 \text{ marcs banco} = 8 \text{ shillings Flemish} \\
 &33\frac{1}{2} \text{ shillings Flemish} = 240 \text{ pence sterling.}
 \end{aligned}$$

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in pence sterling. The only variable numbers are the price of silver at Hamburg, and the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 189629 \text{ fixed logarithm} \\
 \text{Price at Hamburg} \dots 27\frac{3}{4} & + & 144326 \\
 & & \hline
 & & 333955 \\
 \text{Course of exchange} \dots 33 \ 11 & - & 153041 \\
 & & \hline
 & & 180914 = 64\frac{7}{8} \text{ result.}
 \end{array}$$

N. B. The charges are to be added.

## LONDON AND HAMBURG.

SILVER in BARS exported.

Required the price at Hamburg of a marc fine of silver in bars, bought in London at 5 shillings 3 pence sterling per ounce standard, the course of exchange of London on Hamburg being at 34 4.

*Equation.*

$$\begin{aligned}
 &1 \text{ marc fine} = x \\
 &60 \text{ marcs of Hamburg} = 451 \text{ ounces of England} \\
 &37 \text{ ounces fine} = 40 \text{ ounces standard} \\
 &1 \text{ ounce standard} = 63 \text{ pence sterling} \\
 &240 \text{ pence sterling} = 34\frac{1}{2} \text{ shillings Flemish} \\
 &8 \text{ shillings Flemish} = 3 \text{ marcs banco.}
 \end{aligned}$$

Fine silver is reduced into standard silver by opposing 37 to 40, and the result of the equation is in marcs banco. The only variable numbers are the price of silver in London, and the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 \text{Price in London} \dots \dots \dots 63 & = & 179934 \\
 \text{Course of exchange} \dots \dots 34\frac{1}{2} & + & 153572 \\
 & & \hline
 & & 333506 \\
 \text{Fixed logarithm} \dots \dots \dots & - & 189629 \\
 & & \hline
 & & 143877 = 27\frac{9}{10} \text{ result.}
 \end{array}$$

N. B. Reduce the price of silver at London into pence, and add the charges.



## LONDON AND HAMBURG.

## SILVER in BARS.

Required the course of exchange between London and Hamburg resulting from the sale in London, at 5 shillings  $6\frac{1}{2}$  pence sterling, of an ounce standard of silver in bars, bought at Hamburg at 27 marcs 12 shillings banco per marc fine.

Equation.

|                                |                               |
|--------------------------------|-------------------------------|
|                                | 1 pound sterling = x          |
| 1 pound sterling               | = 240 pence sterling          |
| $66\frac{1}{2}$ pence sterling | = 1 ounce standard            |
| 40 ounces standard             | = 37 ounces fine              |
| 451 ounces of England          | = 60 marcs of Hamburg         |
| 1 marc fine                    | = $27\frac{1}{2}$ marcs banco |
| 3 marcs banco                  | = 8 shillings Flemish.        |

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in shillings and grotes Flemish banco. The only variable numbers are the price of silver either at Hamburg or in London.

Solution by Logarithms.

Price at Hamburg .....  $27\frac{1}{2}$  + 189629 fixed logarithm  
144326

333955

Price in London .....  $66\frac{1}{2}$  — 182282

151673 =  $32\frac{10}{16}$  result.

N. B. Reduce the price of silver at London into pence, and add the charges.—This operation to find the course of exchange is the same, whether the silver in bars be imported or exported.

## LONDON AND HAMBURG.

## SPANISH DOLLARS imported.

Required the price in London of an ounce of new dollars  $\frac{14\frac{1}{2}}{16}$  loths fine, bought at Hamburg at 27 marcs 8 shillings banco per marc fine, the course of exchange of Hamburg on London being at 34 l.

Equation.

|                                   |                               |
|-----------------------------------|-------------------------------|
|                                   | 1 ounce of dollars = x        |
| 48 ounces of dollars              | = 43 ounces fine              |
| 451 ounces of England             | = 60 marcs of Hamburg         |
| 1 marc fine                       | = $27\frac{1}{2}$ marcs banco |
| 3 marcs banco                     | = 8 shillings Flemish         |
| $34\frac{1}{2}$ shillings Flemish | = 240 pence sterling.         |

Dollar silver is reduced into fine silver by opposing 48 to 43, and the result of the equation is in pence sterling. The only variable numbers are the price of dollars at Hamburg, and the course of exchange.

Solution by Logarithms.

Price at Hamburg ....  $27\frac{1}{2}$  + 188238 fixed logarithm  
143933

332171

Course of exchange ... 34 l — 153254

178917 =  $61\frac{9}{16}$  result.

N. B. Reduce the price of dollars at London into pence, and add the charges.



## LONDON AND HAMBURG.

SPANISH DOLLARS *exported*.

Required the price at Hamburg of a marc fine of new dollars bought in London at 5 shillings 1 penny sterling per ounce  $\frac{10\frac{3}{4}}{12}$  ounces fine, the course of London on Hamburg being at 34 7.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ marc fine} = x \\
 60 \text{ marcs of Hamburg} & = & 451 \text{ ounces of England} \\
 43 \text{ ounces fine} & = & 48 \text{ ounces of dollars} \\
 1 \text{ ounce of dollars} & = & 61 \text{ pence sterling} \\
 240 \text{ pence sterling} & = & 34\frac{7}{12} \text{ shillings Flemish} \\
 8 \text{ shillings Flemish} & = & 3 \text{ marcs banco.}
 \end{array}$$

Fine silver is reduced into dollar silver by opposing 43 to 48, and the result of the equation is in marcs banco. The only variable numbers are the price of dollars in London, and the course of exchange.

*Solution by Logarithms.*

$$\text{Price in London} \dots\dots 61 = 178533$$

$$\text{Course of exchange} \dots 34 \ 7 + 153887$$

$$\hline 332420$$

$$\text{Fixed logarithm} \dots\dots\dots - 188238$$

$$\hline 144182 = 27\frac{1}{2}\frac{3}{4} \text{ result.}$$

N. B. Reduce the price of dollars at London into pence, and add the charges.

## LONDON AND HAMBURG.

## SPANISH DOLLARS.

Required the course of exchange between London and Hamburg resulting from the sale in London, at 5 shillings 4 pence sterling, of an ounce of dollars  $\frac{14\frac{1}{2}}{16}$  loths fine, bought at Hamburg at 27 marcs 8 shillings banco per marc fine.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling} \\
 64 \text{ pence sterling} & = & 1 \text{ ounce of dollars} \\
 48 \text{ ounces of dollars} & = & 43 \text{ ounces fine} \\
 451 \text{ ounces of England} & = & 60 \text{ marcs of Hamburg} \\
 1 \text{ marc fine} & = & 27\frac{1}{2} \text{ marcs banco} \\
 8 \text{ marcs banco} & = & 8 \text{ shillings Flemish.}
 \end{array}$$

Dollar silver is reduced into fine silver by opposing 48 to 43, and the result of the equation is in shillings and grotes Flemish banco. The only variable numbers are the price of dollars either at Hamburg or in London.

*Solution by Logarithms.*

$$188238 \text{ fixed logarithm}$$

$$\text{Price at Hamburg} \dots\dots 27\frac{1}{2} + 143933$$

$$\hline 332171$$

$$\text{Price in London} \dots\dots 64 - 180618$$

$$\hline 151553 = 32 \ 9\frac{1}{4} \text{ result.}$$

N. B. Reduce the price of dollars at London into pence, and add the charges.—This operation to find the course of exchange is the same, whether the new dollars be imported or exported.



## LONDON AND HOLLAND.

## GOLD in BARS imported.

Required the price in London of an ounce standard of gold in bars, bought at Amsterdam at an agio of 11 per cent above 355 florins current per marc fine, the course of exchange of Amsterdam on London being at 36, and the agio on bank money at  $4\frac{1}{2}$  per cent.

*Equation.*

|                                  |   |                                   |
|----------------------------------|---|-----------------------------------|
|                                  |   | 1 ounce standard = $x$            |
| 12 ounces standard               | = | 11 ounces fine                    |
| 633 ounces of England            | = | 80 marcs of Holland               |
| 1 marc fine                      | = | $394\frac{1}{20}$ florins current |
| $104\frac{1}{2}$ florins current | = | 100 florins banco                 |
| 3 florins banco                  | = | 10 shillings Flemish              |
| 36 shillings Flemish             | = | 20 shillings sterling.            |

Standard gold is reduced into fine gold by opposing 12 to 11; the agio of 11 per cent on 355 florins, that is,  $39\frac{1}{20}$  florins, is added to 355, and the result of the equation is in shillings sterling. The only variable numbers are the price of gold at Amsterdam, the agio on bank money, and the course of exchange.

*Solution by Logarithms.*

|                                      |   |                                         |
|--------------------------------------|---|-----------------------------------------|
|                                      |   | 288781 fixed logarithm                  |
| Price at Amsterdam $394\frac{1}{20}$ | + | 259555                                  |
|                                      |   | <hr/> 548336                            |
| Agio on bank money $104\frac{1}{2}$  | — | 201912                                  |
|                                      |   | <hr/> 346424                            |
| Course of exchange 36                | — | 155630                                  |
|                                      |   | <hr/> 190794 = $80\frac{2}{10}$ result. |

N. B. The charges are to be added.

## LONDON AND HOLLAND.

## GOLD in BARS exported.

Required the price at Amsterdam of a marc fine of gold in bars, bought in London at 3 pounds 19 shillings sterling per ounce standard, the course of exchange of London on Amsterdam being at 37 6, and the agio on bank money at  $4\frac{3}{4}$  per cent.

*Equation.*

|                       |   |                                   |
|-----------------------|---|-----------------------------------|
|                       |   | 1 marc fine = $x$                 |
| 80 marcs of Holland   | = | 633 ounces of England             |
| 11 ounces fine        | = | 12 ounces standard                |
| 1 ounce standard      | = | 79 shillings sterling             |
| 20 shillings sterling | = | $37\frac{1}{2}$ shillings Flemish |
| 10 shillings Flemish  | = | 3 florins banco                   |
| 100 florins banco     | = | $104\frac{3}{4}$ florins current. |

Fine gold is reduced into standard gold by opposing 11 to 12, and the result of the equation is in florins current. The only variable numbers are the price of gold in London, the course of exchange, and the agio on bank money.



*Solution by Logarithms.*

|                            |                  |   |                                   |
|----------------------------|------------------|---|-----------------------------------|
| Price in London . . . . .  | 79               | = | 189763                            |
| Course of exchange . . . . | $37\frac{1}{2}$  | + | 157403                            |
| Agio on bank money . . . . | $104\frac{1}{4}$ | + | 202015                            |
|                            |                  |   | <hr/>                             |
|                            |                  |   | 549181                            |
| Fixed logarithm . . . . .  |                  | — | 288781                            |
|                            |                  |   | <hr/>                             |
|                            |                  |   | 260400 = $401\frac{1}{2}$ result. |

N.B. Reduce the price of gold at London into shillings, and add the charges.—The difference between  $401\frac{1}{2}$  florins current, amount of the result, and 355 florins current, price fixed by the law, being  $46\frac{1}{2}$ , in order to calculate the agio above 355, state the following proportion :

$$355 : 46\frac{1}{2} :: 100 : 13\frac{1}{2}\frac{1}{2} \text{ result.}$$

**LONDON AND HOLLAND.****GOLD in BARS.**

Required the course of exchange between London and Amsterdam resulting from the sale in London, at 4 pounds 1 shilling sterling, of an ounce standard of gold in bars, bought at Amsterdam at the agio of 11 per cent above 355 florins currents per marc fine, the agio on bank money being at 5 per cent at the latter place.

*Equation.*

|                       |   |                                   |
|-----------------------|---|-----------------------------------|
|                       |   | 1 pound sterling = $x$            |
| 1 pound sterling      | = | 20 shillings sterling             |
| 81 shillings sterling | = | 1 ounce standard                  |
| 12 ounces standard    | = | 11 ounces fine                    |
| 633 ounces of England | = | 80 marcs of Holland               |
| 1 marc fine           | = | $394\frac{1}{20}$ florins current |
| 105 florins current   | = | 100 florins banco                 |
| 3 florins banco       | = | 10 shillings Flemish.             |

Standard gold is reduced into fine gold by opposing 12 to 11 ; the agio of 11 per cent on 355 florins, that is,  $39\frac{1}{20}$  florins, is added to 355, and the result of the equation is in shillings and grotes Flemish banco. The only variable numbers are the price of gold either at Amsterdam or in London, and the agio on bank money.

*Solution by Logarithms.*

|                       |                   |        |                 |
|-----------------------|-------------------|--------|-----------------|
|                       |                   | 288781 | fixed logarithm |
| Price at Amsterdam .. | $394\frac{1}{20}$ | +      | 259555          |
|                       |                   |        | <hr/>           |
|                       |                   |        | 548336          |
| Price in London ..... | 81                | —      | 190849          |
|                       |                   |        | <hr/>           |
|                       |                   |        | 357487          |
| Agio on bank money..  | 105               | —      | 202119          |
|                       |                   |        | <hr/>           |

$$155368 = 35\ 9\frac{1}{2} \text{ result.}$$

N.B. Reduce the price of gold at London into shillings, and add the charges.

This operation to find the course of exchange is the same, whether the gold in bars be imported or exported.



## LONDON AND HOLLAND.

## SILVER in BARS imported.

Required the price in London of an ounce standard of silver in bars, bought at Amsterdam at 25 florins 3 stivers current per marc fine, the course of exchange of Amsterdam on London being at 36 4, and the agio on bank money at  $4\frac{3}{4}$  per cent.

*Equation.*

$$1 \text{ ounce standard} = x$$

$$40 \text{ ounces standard} = 37 \text{ ounces fine}$$

$$633 \text{ ounces of England} = 80 \text{ marcs of Holland}$$

$$1 \text{ marc fine} = 25\frac{3}{20} \text{ florins current}$$

$$104\frac{3}{4} \text{ florins current} = 100 \text{ florins banco}$$

$$3 \text{ florins banco} = 10 \text{ shillings Flemish}$$

$$36\frac{1}{2} \text{ shillings Flemish} = 240 \text{ pence sterling.}$$

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in pence sterling. The only variable numbers are the price of silver at Amsterdam, the agio on bank money, and the course of exchange.

*Solution by Logarithms.*

|                                        |   |        |                           |
|----------------------------------------|---|--------|---------------------------|
|                                        |   | 397092 | fixed logarithm           |
| Price at Amsterdam .. $25\frac{3}{20}$ | + | 140054 |                           |
|                                        |   | 537146 |                           |
| Agio on bank money .. $104\frac{3}{4}$ | — | 202015 |                           |
|                                        |   | 335131 |                           |
| Course of exchange.. 36 4              | — | 156031 |                           |
|                                        |   | 179100 | = $61\frac{1}{2}$ result. |

N. B. The charges are to be added,

## LONDON AND HOLLAND.

## SILVER in BARS exported.

Required the price at Amsterdam of a marc fine of silver in bars, bought at London at 5 shillings 3 pence sterling per ounce standard, the course of exchange of London on Amsterdam being at 37 2, and the agio on bank money at  $4\frac{3}{4}$ .

*Equation.*

$$1 \text{ marc fine} = x$$

$$80 \text{ marcs of Holland} = 633 \text{ ounces of England}$$

$$37 \text{ ounces fine} = 40 \text{ ounces standard}$$

$$1 \text{ ounce standard} = 63 \text{ pence sterling}$$

$$240 \text{ pence sterling} = 37\frac{1}{2} \text{ shillings Flemish}$$

$$10 \text{ shillings Flemish} = 3 \text{ florins banco}$$

$$100 \text{ florins banco} = 104\frac{3}{4} \text{ florins current.}$$

S

Fine



Fine silver is reduced into standard silver by opposing 37 to 40, and the result of the equation is in florins and stivers current. The only variable numbers are the price of silver in London, the course of exchange, and the agio on bank money.

*Solution by Logarithms.*

|                         |                  |   |        |
|-------------------------|------------------|---|--------|
| Price in London.....    | 63               | = | 179934 |
| Course of exchange .... | $37\frac{1}{6}$  | + | 157015 |
| Agio on bank money ...  | $104\frac{3}{4}$ | + | 202015 |
|                         |                  |   | <hr/>  |
|                         |                  |   | 538964 |
| Fixed logarithm .....   |                  | — | 397092 |
|                         |                  |   | <hr/>  |

$$141872 = 25 \ 12\frac{1}{2} \text{ result.}$$

N.B. Reduce the price of silver at London into pence, and add the charges.

## LONDON AND HOLLAND.

### SILVER in BARS.

Required the course of exchange between London and Amsterdam resulting from the sale in London, at 5 shillings  $5\frac{1}{2}$  pence sterling, of an ounce standard of silver in bars, bought at Amsterdam at 25 florins 15 stivers current per marc fine, the agio on bank money being at 5 per cent at the latter place.

*Equation.*

|  |                                |   |                                 |
|--|--------------------------------|---|---------------------------------|
|  | 1 pound sterling               | = | $x$                             |
|  | 1 pound sterling               | = | 240 pence sterling              |
|  | $65\frac{1}{2}$ pence sterling | = | 1 ounce standard                |
|  | 40 ounces standard             | = | 37 ounces fine                  |
|  | 633 ounces of England          | = | 80 marcs of Holland             |
|  | 1 marc fine                    | = | $25\frac{3}{4}$ florins current |
|  | 105 florins current            | = | 100 florins banco               |
|  | 3 florins banco                | = | 10 shillings Flemish.           |

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in shillings Flemish banco. The only variable numbers are the price of silver either at Amsterdam or in London, and the agio on bank money.

*Solution by Logarithms.*

|                         |                 |        |                 |
|-------------------------|-----------------|--------|-----------------|
|                         |                 | 397092 | fixed logarithm |
| Price at Amsterdam .... | $25\frac{3}{4}$ | +      | 141078          |
|                         |                 |        | <hr/>           |
|                         |                 |        | 538170          |
| Price in London.....    | $65\frac{1}{2}$ | —      | 181624          |
|                         |                 |        | <hr/>           |
|                         |                 |        | 356546          |
| Agio on bank money....  | 105             | —      | 202119          |
|                         |                 |        | <hr/>           |

$$154427 = 35 \text{ result.}$$

N.B. Reduce the price of silver at London into pence, and add the charges.

This operation to find the course of exchange is the same, whether the silver in bars be imported or exported.



## LONDON AND HOLLAND.

SPANISH DOLLARS *imported*.

Required the price in London of an ounce of new dollars, bought at Amsterdam at  $51\frac{1}{2}$  stivers current per dollar, the course of exchange of Amsterdam on London being at 36 1, and the agio on bank money at  $4\frac{1}{2}$  per cent.

*Equation.*

|                                   |                                   |
|-----------------------------------|-----------------------------------|
|                                   | 1 ounce = $x$                     |
| 865 ounces                        | = 1000 dollars                    |
| 1 dollar                          | = $51\frac{1}{2}$ stivers current |
| 20 stivers current                | = 1 florin current                |
| $104\frac{1}{2}$ florins current  | = 100 florins banco               |
| 3 florins banco                   | = 10 shillings Flemish            |
| $36\frac{1}{2}$ shillings Flemish | = 240 pence sterling.             |

The result of this equation is in pence sterling, and the only variable numbers are the price of a dollar at Amsterdam, the agio on bank money, and the course of exchange.

*Solution by Logarithms.*

|                          |                    |                                  |
|--------------------------|--------------------|----------------------------------|
|                          |                    | 866504 fixed logarithm           |
| Price at Amsterdam ..... | $51\frac{1}{2} +$  | 171181                           |
|                          |                    | <hr/>                            |
|                          |                    | 537685                           |
| Agio on bank money ..... | $104\frac{1}{2} -$ | 201912                           |
|                          |                    | <hr/>                            |
|                          |                    | 335773                           |
| Course of exchange ..... | $36\ 1 -$          | 155731                           |
|                          |                    | <hr/>                            |
|                          |                    | 180042 = $63\frac{5}{2}$ result. |

N. B. The charges are to be added.

## LONDON AND HOLLAND.

SPANISH DOLLARS *exported*.

Required the price at Amsterdam of new dollars bought in London at 5 shillings 2 pence sterling per ounce, the course of exchange of London on Amsterdam being at 36 9, and the agio on bank money at  $4\frac{1}{2}$  per cent.

*Equation.*

|                      |                                     |
|----------------------|-------------------------------------|
|                      | 1 dollar = $x$                      |
| 1000 dollars         | = 865 ounces                        |
| 1 ounce              | = 62 pence sterling                 |
| 240 pence sterling   | = $36\frac{1}{2}$ shillings Flemish |
| 10 shillings Flemish | = 3 florins banco                   |
| 100 florins banco    | = $104\frac{1}{2}$ florins current  |
| 1 florin current     | = 20 stivers current.               |

The result of this equation is in stivers and penings current, and the only variable numbers are the price of dollars in London, the course of exchange, and the agio on bank money.

*Solution by Logarithms.*

|                       |                    |        |
|-----------------------|--------------------|--------|
| Price in London ..... | 62 =               | 179239 |
| Course of exchange... | $36\frac{1}{2} +$  | 156526 |
| Agio on bank money    | $104\frac{1}{2} +$ | 202015 |
|                       |                    | <hr/>  |
|                       |                    | 537780 |
| Fixed logarithm.....  | =                  | 366504 |
|                       |                    | <hr/>  |

171276 = 51 10 result.

N. B. Reduce the price of dollars at London into pence, and add the charges.



## LONDON AND HOLLAND.

## SPANISH DOLLARS.

Required the course of exchange between London and Amsterdam resulting from the sale in London, at 5 shillings 6 pence sterling, of an ounce of new dollars, bought at Amsterdam at  $52\frac{1}{2}$  stivers current per dollar, the course of exchange of Amsterdam on London being at 35 10, and the agio on bank money at 5 per cent.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = x \\
 1 \text{ pound sterling} & = & 240 \text{ pence sterling} \\
 66 \text{ pence sterling} & = & 1 \text{ ounce} \\
 865 \text{ ounces} & = & 1000 \text{ dollars} \\
 1 \text{ dollar} & = & 52\frac{1}{2} \text{ stivers current} \\
 20 \text{ stivers current} & = & 1 \text{ florin current} \\
 105 \text{ florins current} & = & 100 \text{ florins banco} \\
 3 \text{ florins banco} & = & 10 \text{ shillings Flemish.}
 \end{array}$$

The result of this equation is in shillings and grotes Flemish banco, and the only variable numbers are the price of dollars either in London or at Amsterdam, and the agio on bank money.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 & & 366504 \text{ fixed logarithm} \\
 \text{Price at Amsterdam} & \dots\dots\dots 52\frac{1}{2} & + 172016 \\
 & & \hline
 & & 538520 \\
 \text{Price in London} & \dots\dots\dots 66 & - 181954 \\
 & & \hline
 & & 356566 \\
 \text{Agio on bank money} & \dots\dots\dots 105 & - 202119 \\
 & & \hline
 & & 154447 = 35 \text{ } 0\frac{2}{3} \text{ result.}
 \end{array}$$

N. B. Reduce the price of dollars at London into pence, and add the charges.—This operation to find the course of exchange is the same, whether the new dollars be imported or exported.

## LONDON AND PORTUGAL.

## GOLD in BARS.

Required the price in London of an ounce standard of gold in bars, bought at Lisbon at 1680 reis legal money per outava  $\frac{3}{4}$  carats fine, the course of exchange of Lisbon on London being at 62.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ ounce standard} = x \\
 369 \text{ ounces of England} & = & 50 \text{ marcs of Portugal} \\
 1 \text{ marc} & = & 64 \text{ outavas} \\
 1 \text{ outava} & = & 1680 \text{ reis} \\
 1000 \text{ reis} & = & 62 \text{ pence sterling} \\
 12 \text{ pence sterling} & = & 1 \text{ shilling sterling.}
 \end{array}$$

The standard of gold in bars is the same, and the result of the equation is in shillings sterling. The only variable numbers are the price of gold at Lisbon, and the course of exchange.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 \text{Price at Lisbon} & \dots\dots\dots 1680 & = 322531 \\
 \text{Course of exchange} & \dots\dots\dots 62 & + 179239 \\
 & & \hline
 & & 501770 \\
 \text{Fixed logarithm} & \dots\dots\dots & - 314106 \\
 & & \hline
 & & 187664 = 75 \text{ } 9\frac{1}{2} \text{ result.}
 \end{array}$$

N. B. The charges are to be added.



## LONDON AND PORTUGAL.

GOLD *in* BARS.

Required the course of exchange between London and Lisbon resulting from the sale in London, at 3 pounds 19 shillings 6 pence sterling, of an ounce standard of gold in bars, bought at Lisbon at 1695 reis legal money per outava  $\frac{2}{4}$  carats fine.

|                      |                                      |
|----------------------|--------------------------------------|
| <i>Equation.</i>     | 1000 reis = $x$                      |
| 1695 reis            | = 1 outava                           |
| 64 outavas           | = 1 marc                             |
| 50 marcs of Portugal | = 369 ounces of England              |
| 1 ounce standard     | = $79\frac{1}{2}$ shillings sterling |
| 20 shillings         | = 240 pence.                         |

The standard of gold in bars is the same, and the result of the equation is in pence sterling. The only variable numbers are the price of gold either in London or at Lisbon.

|                                    |                        |
|------------------------------------|------------------------|
| <i>Solution by Logarithms.</i>     | 314106 fixed logarithm |
| Price in London... $79\frac{1}{2}$ | + 190037               |
|                                    | <hr/>                  |
|                                    | 504143                 |
| Price at Lisbon.... 1695           | — 322917               |
|                                    | <hr/>                  |

181226 =  $64\frac{2}{3}$  result.

N. B. Reduce the price of gold at London into shillings, and deduct the charges.

## LONDON AND PORTUGAL.

SILVER *in* BARS.

Required the price in London of an ounce standard of silver in bars, bought at Lisbon at 990 reis legal money per ounce fine, the course of exchange of Lisbon on London being at  $62\frac{1}{2}$ .

|                       |                                   |
|-----------------------|-----------------------------------|
| <i>Equation.</i>      | 1 ounce standard = $x$            |
| 40 ounces standard    | = 37 ounces fine                  |
| 369 ounces of England | = 400 ounces of Portugal          |
| 1 ounce fine          | = 990 reis                        |
| 1000 reis             | = $62\frac{1}{2}$ pence sterling. |

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in pence sterling. The only variable numbers are the price of silver at Lisbon, and the course of exchange.

|                                    |          |
|------------------------------------|----------|
| <i>Solution by Logarithms.</i>     |          |
| Price at Lisbon... 990             | = 299564 |
| Course of exchange $62\frac{1}{2}$ | + 179588 |
|                                    | <hr/>    |
|                                    | 479152   |
| Fixed logarithm.....               | — 299883 |
|                                    | <hr/>    |

179269 =  $62\frac{1}{2}$  result.

N. B. The charges are to be added.



## LONDON AND PORTUGAL.

## SILVER in BARS.

Required the course of exchange between London and Lisbon resulting from the sale in London, at 5 shillings  $6\frac{1}{2}$  pence sterling, of an ounce standard of silver in bars, bought at Lisbon at 995 reis legal money per ounce fine.

Equation.

$$\begin{array}{rcl}
 995 \text{ reis} & = & 1000 \text{ reis} = x \\
 400 \text{ ounces of Portugal} & = & 1 \text{ ounce fine} \\
 37 \text{ ounces fine} & = & 369 \text{ ounces of England} \\
 1 \text{ ounce standard} & = & 40 \text{ ounces standard} \\
 & & 66\frac{1}{2} \text{ pence sterling.}
 \end{array}$$

Fine silver is reduced into standard silver by opposing 37 to 40, and the result of the equation is in pence sterling. The only variable numbers are the price of silver either in London or at Lisbon.

Solution by Logarithms.

$$\begin{array}{rcl}
 & & 299883 \text{ fixed logarithm} \\
 \text{Price in London... } 66\frac{1}{2} & + & 182282 \\
 & & \hline
 & & 482165 \\
 \text{Price at Lisbon... } 995 & - & 299782 \\
 & & \hline
 & & 182383 = 66\frac{1}{2} \text{ result.}
 \end{array}$$

N. B. Reduce the price of silver at London into pence, and deduct the charges.

## LONDON AND PORTUGAL.

## GOLD COIN of PORTUGAL.

Required the price in London of an ounce of Joaneses, remitted from Lisbon while the course of exchange on London is at  $62\frac{1}{2}$ , and the discount upon paper money at  $10\frac{1}{2}$  per cent.

Equation.

$$\begin{array}{rcl}
 184\frac{1}{2} \text{ ounces of England} & = & 1 \text{ ounce} = x \\
 1 \text{ Joaneses} & = & 400 \text{ Joaneses} \\
 94\frac{3}{4} \text{ reis effective money} & = & 6400 \text{ reis effective money} \\
 1000 \text{ reis legal money} & = & 100 \text{ reis legal money} \\
 12 \text{ pence sterling} & = & 62\frac{1}{2} \text{ pence sterling} \\
 & & 1 \text{ shilling sterling.}
 \end{array}$$

Lisbon receives 1000 reis *legal money* for  $62\frac{1}{2}$  pence sterling, which it draws; but as a Joaneses is worth 6400 reis in *effective money*, the discount which obtains upon paper money should be allowed upon one half of the sum remitted, which is tantamount to opposing  $94\frac{3}{4}$  to 100, that is, to deducting one half of the discount upon the whole sum. The result of the equation is in shillings sterling, and the only variable numbers are the course of exchange, and the amount of the discount at Lisbon.

Solution by Logarithms.

$$\begin{array}{rcl}
 & & 206365 \text{ fixed logarithm} \\
 \text{Course of exchange.... } 62\frac{1}{2} & + & 179414 \\
 & & \hline
 & & 385779 \\
 100, \text{ less half the discount } 94\frac{3}{4} & - & 197658 \\
 & & \hline
 & & 188121 = 76\frac{1}{16} \text{ result.}
 \end{array}$$

N. B. Subtract the logarithm of 100, less half the discount, and add the charges.



## LONDON AND PORTUGAL.

## GOLD COIN of PORTUGAL.

Required the course of exchange between London and Lisbon resulting from the sale in London, at 3 pounds 19 shillings 3 pence sterling, of an ounce of Joanesse remitted from Lisbon while the discount upon paper money at Lisbon is at  $11\frac{1}{4}$  per cent.

*Equation.*

$$\begin{aligned}
 1000 \text{ reis legal money} &= x \\
 100 \text{ reis legal money} &= 94\frac{3}{8} \text{ reis effective money} \\
 6400 \text{ reis effective money} &= 1 \text{ Joanesse} \\
 400 \text{ Joanesse} &= 184\frac{1}{4} \text{ ounces of England} \\
 1 \text{ ounce} &= 79\frac{1}{4} \text{ shillings sterling} \\
 1 \text{ shilling sterling} &= 12 \text{ pence sterling.}
 \end{aligned}$$

The certain price of the exchange between London and Lisbon being in reis *legal money*, it follows that half the discount upon 6400 reis *effective money*, or the value of a Joanesse, should be allowed, which is tantamount to opposing 100 to  $94\frac{3}{8}$ . The result of the equation is in pence sterling, and the only variable numbers are the price of Joanesse in London, and the amount of the discount at Lisbon.

*Solution by Logarithms.*

$$\begin{aligned}
 \text{Price in London} &\dots\dots\dots 79\frac{1}{4} = 189900 \\
 100, \text{ less half the discount.} &94\frac{3}{8} + 197486
 \end{aligned}$$

387386

$$\text{Fixed logarithm} \dots\dots\dots - 206365$$

181021 =  $64\frac{1}{2}$  result.

N. B. Reduce the price of Joanesse at London into shillings, add the logarithm of 100, less half the discount, and deduct the charges.

## LONDON AND PORTUGAL.

## SPANISH DOLLARS.

Required the price in London of an ounce of new dollars bought at Lisbon at 850 reis legal money per dollar, the course of exchange of Lisbon on London being at  $62\frac{5}{8}$ .

*Equation.*

$$\begin{aligned}
 1 \text{ ounce} &= x \\
 865 \text{ ounces} &= 1000 \text{ dollars} \\
 1 \text{ dollar} &= 850 \text{ reis} \\
 1000 \text{ reis} &= 62\frac{5}{8} \text{ pence.}
 \end{aligned}$$

The result of the equation is in pence sterling, and the only variable numbers are the price of dollars at Lisbon, and the course of exchange.

*Solution by Logarithms.*

$$\begin{aligned}
 \text{Price at Lisbon} &\dots\dots\dots 850 = 292942 \\
 \text{Course of exchange} &\dots\dots 62\frac{5}{8} + 179675
 \end{aligned}$$

472617

$$\text{Fixed logarithm} \dots\dots\dots - 293702$$

178915 =  $61\frac{1}{2}$  result.

N. B. The charges are to be added.



## LONDON AND PORTUGAL.

## SPANISH DOLLARS.

Required the course of exchange between London and Lisbon resulting from the sale in London, at 5 shillings 5 pence sterling, of an ounce of new dollars, bought at Lisbon at 840 reis legal money per dollar.

$$\begin{array}{rcl}
 \text{Equation.} & & 1000 \text{ reis} = x \\
 & 840 \text{ reis} & = 1 \text{ dollar} \\
 & 1000 \text{ dollars} & = 865 \text{ ounces} \\
 & 1 \text{ ounce} & = 65 \text{ pence.}
 \end{array}$$

The result of the equation is in pence sterling, and the only variable numbers are the price of dollars either in London or at Lisbon.

*Solution by Logarithms.* 293702 fixed logarithm

Price in London . . . . . 65 + 181291

474993

Price at Lisbon . . . . . 840 — 292428

182565 =  $66\frac{1}{2}$  result.

N. B. Reduce the price of dollars at London into pence, and deduct the charges.

## LONDON AND SPAIN.

## GOLD in BARS.

Required the price in London of an ounce standard of gold in bars, bought at Cadiz at  $29\frac{1}{2}$  reals of plate per castellano  $\frac{22\frac{1}{2}}{24}$  carats fine, the course of exchange of Cadiz on London being at  $36\frac{1}{4}$ .

*Equation.* 1 ounce standard = x

37 ounces of England = 250 castellanos of Spain

45 castellanos  $\frac{4\frac{1}{2}}{8}$  fine = 44 castellanos  $\frac{4\frac{1}{2}}{8}$  fine

1 castellano  $\frac{4\frac{1}{2}}{8}$  fine =  $29\frac{1}{2}$  reals of plate

8 reals of plate =  $36\frac{1}{4}$  pence sterling

12 pence sterling = 1 shilling sterling.

Standard gold is reduced into castellano gold by opposing 45 to 44, and the result of the equation is in shillings sterling. The only variable numbers are the price of gold at Cadiz, and the course of exchange.

*Solution by Logarithms.*

Price at Cadiz . . . . .  $29\frac{1}{2}$  = 146982

Course of exchange . . . . .  $36\frac{1}{4}$  + 155931

302913

Fixed logarithm . . . . . — 116229

186684 =  $73\frac{1}{2}$  result.

N. B. The charges are to be added,



## LONDON AND SPAIN.

## GOLD in BARS.

Required the course of exchange between London and Cadiz resulting from the sale in London, at 4 pounds 6 pence sterling, of an ounce standard of gold in bars, bought at Cadiz at  $29\frac{1}{2}$  reals of plate per castellano  $\frac{22\frac{1}{2}}{24}$  carats fine.

*Equation.*

|                                               |   |                                               |
|-----------------------------------------------|---|-----------------------------------------------|
| 1 dollar of exchange                          | = | 8 reals of plate                              |
| $29\frac{1}{2}$ reals of plate                | = | 1 castellano $\frac{4\frac{5}{8}}{48}$ fine   |
| 44 castellanos $\frac{4\frac{5}{8}}{48}$ fine | = | 45 castellanos $\frac{4\frac{4}{8}}{48}$ fine |
| 250 castellanos of Spain                      | = | 37 ounces of England                          |
| 1 ounce standard                              | = | $80\frac{1}{2}$ shillings sterling            |
| 1 shilling sterling                           | = | 12 pence sterling.                            |

Castellano gold is reduced into standard gold by opposing 44 to 45, and the result of the equation is in pence sterling. The only variable numbers are the price of gold either in London or at Cadiz.

*Solution by Logarithms.*

|                       |                   |                                  |
|-----------------------|-------------------|----------------------------------|
|                       |                   | 116229 fixed logarithm           |
| Price in London ..... | $80\frac{1}{2} +$ | 190580                           |
|                       |                   | 306809                           |
| Price at Cadiz .....  | $29\frac{1}{2} -$ | 146982                           |
|                       |                   | 159827 = $39\frac{1}{2}$ result. |

N. B. Reduce the price of gold at London into shillings, and deduct the charges.

## LONDON AND SPAIN.

## SILVER in BARS.

Required the price in London of an ounce standard of silver in bars, bought at Cadiz at 105 reals of plate per marc fine of Castille, the course of exchange of Cadiz on London being at  $36\frac{1}{4}$ .

*Equation.*

|                      |   |                                 |
|----------------------|---|---------------------------------|
|                      |   | 1 ounce standard = x            |
| 40 ounces standard   | = | 37 ounces fine                  |
| 37 ounces of England | = | 5 marcs of Castille             |
| 1 marc fine          | = | 105 reals of plate              |
| 8 reals of plate     | = | $36\frac{1}{4}$ pence sterling. |

Standard silver is reduced into fine silver by opposing 40 to 37, and the result of the equation is in pence sterling. The only variable numbers are the price of silver at Cadiz, and the course of exchange.

*Solution by Logarithms.*

|                         |                   |                                  |
|-------------------------|-------------------|----------------------------------|
| Price at Cadiz .....    | 105 =             | 202119                           |
| Course of exchange .... | $36\frac{1}{4} +$ | 155931                           |
|                         |                   | 358050                           |
| Fixed logarithm .....   | -                 | 180618                           |
|                         |                   | 177432 = $59\frac{1}{4}$ result. |

N. B. The charges are to be added.



## LONDON AND SPAIN.

## SILVER in BARS.

Required the course of exchange between London and Cadiz resulting from the sale in London, at 5 shillings 5 pence sterling, of an ounce standard of silver in bars, bought at Cadiz at 106 reals of plate per marc fine of Castille.

|                        |                            |
|------------------------|----------------------------|
| <i>Equation.</i>       | 1 dollar of exchange = $x$ |
| 1 dollar of exchange = | 8 reals of plate           |
| 106 reals of plate =   | 1 marc fine                |
| 5 marcs of Castille =  | 37 ounces of England       |
| 37 ounces fine =       | 40 ounces standard         |
| 1 ounce standard =     | 65 pence sterling.         |

Fine silver is reduced into standard silver by opposing 37 to 40, and the result of the equation is in pence sterling. The only variable numbers are the price of silver either in London or at Cadiz.

*Solution by Logarithms.* 180618 fixed logarithm

Price in London ..... 65 + 181291

361909

Price at Cadiz ..... 106 — 202531

159378 =  $39\frac{1}{4}$  result.

N. B. Reduce the price of silver at London into pence, and deduct the charges.

## LONDON AND SPAIN.

## NEW DOUBLOONS.

Required the price in London of an ounce of doubloons remitted from Cadiz, the course of exchange of Cadiz on Lisbon being at  $36\frac{1}{4}$ .

|                            |                                |
|----------------------------|--------------------------------|
| <i>Equation.</i>           | 1 ounce = $x$                  |
| 866 $\frac{1}{2}$ ounces = | 1000 doubloons                 |
| 1 doubloon =               | 170 reals of plate             |
| 8 reals of plate =         | $36\frac{1}{4}$ pence sterling |
| 12 pence sterling =        | 1 shilling sterling.           |

The result of the equation is in shillings sterling, and the only variable number is the course of exchange.

*Solution by Logarithms.* 31041 fixed logarithm

Course of exchange ....  $36\frac{1}{4}$  + 155931

186972 =  $74\frac{1}{2}$  result.

N. B. The charges are to be added.



## LONDON AND SPAIN.

## NEW DOUBLOONS.

Required the course of exchange between London and Cadiz resulting from the sale in London, at 3 pounds 18 shillings 6 pence sterling, of an ounce of new doubloons remitted from Cadiz.

|                        |                            |
|------------------------|----------------------------|
| <i>Equation.</i>       | 1 dollar of exchange = $x$ |
| 1 dollar of exchange = | 8 reals of plate           |
| 170 reals of plate =   | 1 doubloon                 |
| 1000 doubloons =       | $866\frac{1}{2}$ ounces    |
| 1 ounce =              | $78\frac{1}{2}$ shillings  |
| 1 shilling =           | 12 pence.                  |

The result of the equation is in pence sterling, and the only variable number is the price of new doubloons in London.

*Solution by Logarithms.*

|                 |       |                 |   |        |
|-----------------|-------|-----------------|---|--------|
| Price in London | ..... | $78\frac{1}{2}$ | = | 189487 |
| Fixed logarithm | ..... | —               |   | 31041  |

$$158446 = 38\frac{5}{12} \text{ result.}$$

N. B. Reduce the price of doubloons at London into shillings, and deduct the charges.

## LONDON AND SPAIN.

## NEW DOLLARS.

Required the price in London of an ounce of hard dollars, quite new, remitted from Cadiz, the course of exchange of Cadiz on London being at  $36\frac{1}{8}$ .

|                           |                                 |
|---------------------------|---------------------------------|
| <i>Equation.</i>          | 1 ounce = $x$                   |
| $866\frac{1}{4}$ ounces = | 1000 hard dollars               |
| 64 hard dollars =         | 85 dollars of exchange          |
| 1 dollar of exchange =    | $36\frac{1}{8}$ pence sterling. |

The result of the equation is in pence sterling, and the only variable number is the course of exchange.

|                                         |                       |
|-----------------------------------------|-----------------------|
| <i>Solution by Logarithms.</i>          | 18560 fixed logarithm |
| Course of exchange .... $36\frac{1}{8}$ | + 155781              |

$$174341 = 55\frac{3}{8} \text{ result.}$$

N. B. The charges are to be added.

In respect to dollars which have been circulated, the fixed logarithm to be employed is 18622, as 1000 dollars only render, in general, 865 ounces,



## LONDON AND SPAIN.

## NEW DOLLARS.

Required the course of exchange between London and Cadiz resulting from the sale in London, at 5 shillings  $3\frac{1}{2}$  pence sterling, of an ounce of hard dollars, quite new, remitted from Cadiz.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ dollar of exchange} = x \\
 85 \text{ dollars of exchange} & = & 64 \text{ hard dollars} \\
 1000 \text{ hard dollars} & = & 866\frac{1}{4} \text{ ounces} \\
 1 \text{ ounce} & = & 63\frac{1}{2} \text{ pence.}
 \end{array}$$

The result of the equation is in pence sterling, and the only variable number is the price of dollars in London.

*Solution by Logarithms.*

$$\begin{array}{rcl}
 \text{Price in London} & \dots\dots\dots 63\frac{1}{2} & = 180277 \\
 \text{Fixed logarithm} & \dots\dots\dots - & 18560 \\
 \hline
 & & 161717 = 41\frac{5}{12} \text{ result.}
 \end{array}$$

N. B. Reduce the price of new dollars at London into pence, and deduct the charges.

In respect to dollars which have been circulated, the fixed logarithm to be employed is 18622, as 1000 dollars only render, in general, 865 ounces.



OF  
PARS  
OF  
**Exchange and of Coins.**

---

**SPEAKING** of Exchange Operations, page 14, I referred to two pars of exchange, which I distinguished by the respective appellations of *intrinsic* and *eventual*. The analysis and manner of calculating each are the subjects which I now propose to consider. I shall, then, determine the intrinsic par of exchange between London and the several places with which we have an exchange open; and the rules of calculation which I shall give, the operations which will be described, together with the tables of comparison of gold and silver coins, inserted in a subsequent part of this work, will afford the means of determining the pars of exchange between London and those places with which not any course of exchange is established.

OF THE INTRINSIC PAR.

The expression of *intrinsic par* is intended to convey an idea, in general, of a mean par between two intrinsic pars, resulting from a comparison of the gold and silver coins respectively of one state with those of another state. Hence it is that writers upon Commercial Economy, considering the intrinsic par between England and France according to the antient method of quoting the exchange, agreed in deeming 60 sols tournois as the counter-value, or par, for 29 pence sterling, being a mean term between the par of 60 sols opposed to 30 pence, and resulting from the comparison of the gold coins of the two countries; and the par of 60 sols opposed to 28 pence, and resulting from a similar comparison of their silver coins.

Some of the writers alluded to have considered the mean par as an accessory of mere curiosity, while others have attached to it a considerable degree of importance; and, indeed, it would seem that the latter opinion has prevailed, since there are publications at



Altona, and at London, of tables of arbitrations calculated with reference to the consideration of exchanges as above or below par.

Let us therefore examine whether the intrinsic or real par of monies be of that importance in exchanges which is attributed to it.

Two quantities of money of different countries are at par, when they are of that reciprocal equivalence as to be mutually exchangeable, either abstractedly from any inequality in those circumstances relative to each which might affect the conditions of an exchange, or in supposing such circumstances to be perfectly and reciprocally equal, and mutually known and admitted. Such par, therefore, or absolute equivalence, considered in the abstract, would exist between two like quantities of the same metal; each being virtually separated from the value of any alloy, which is always deemed negative.

Under this point of view, there are, therefore, two intrinsic pars in respect to the monies of two countries; that of the monies of gold of the one as opposed to the monies of gold of the other, and that of their respective monies of silver.

But, as the relation between the value of these metals is almost every where different, being a matter of local regulation of governments in respect to the coinage adopted by each, and as the general course of commerce effects frequent alterations in the value of gold and silver in respect to each other, we may conclude that a mean intrinsic par cannot, of necessity, be correct, and that, as it is founded upon circumstances perpetually changing, or susceptible of change, it cannot have any existence in reality, whether it be supposed that the monies compared be composed of like quantities of the two metals, or that the same par be the result of a comparison of monies having different proportions.

In fact, if we consider that the objects of comparison are two, of a different nature, and consequently distinct from each other, we shall be convinced that the pars to be distinguished are two, and not more.

It is known that gold and silver derive their principal value from their scarcity, and from the price of a greater or less degree of labour and of time employed in extracting them from the earth. Thus, as their value is relative to the coincidence of several elements, each naturally variable, it follows that such value is not re-



ducible to any constant relation ; and, therefore, that a natural equivalence between these metals cannot be determined, any more than a similar equivalence between different articles of merchandize.

In certain countries, such as Portugal and England, the payments of commerce are generally made in gold coins ; while in other countries, such as Spain and France, similar payments are made almost exclusively in silver coins. The par of exchange between Portugal and England cannot, therefore, be properly considered but in respect to the gold coins of those countries, while the par between Spain and France is in like manner relative to their silver currency.

In France, and in respect to the exchange with England, the par of exchange can only be appreciated by considering as merchandize the gold which the latter pays to the former ; and, reciprocally, England can only consider as merchandize the silver which she receives from France in her commutations with that country. Hence, there is not any permanent basis of calculation upon which may be grounded the expression of a real par of monies, as relating to the exchange between these two nations.

Spain is to England the source of its silver coinage ; and, if the inequality of the circumstances which determine the measure of their exchanges be such, that the greater or less degree of abundance of silver is inherent in one of those countries, while the degree of occasion for the same metal is in like manner inherent in the other ; if these circumstances, which are inseparable from the respective position of each, have a constant tendency to the same effect reciprocally, how can we conceive, according to the case itself, a real par of exchange, abstracted from the influence of the circumstances in question upon the identical objects of comparison ?

The comparison of the quantity of fine silver contained in a Spanish hard dollar with that which is contained in our crown-piece, establishes the intrinsic par of the dollar of exchange at 39,22 pence sterling.

However, by a necessary consequence of the circumstances of which I have just spoken, the dollar of exchange uniformly finds its level in the commerce between the two countries, in a price exceeded by the par in question by as much as is the aggregate amount of the duties levied by the King of Spain upon the expor-



tation of dollars; of the freight; the insurance against all the risks to which they may be exposed; the charges of conveyance to the capital after their arrival in England; the wear to which they are subject by the collision; the interest of the funds employed from the time of the transmission to that of the sale; the commission and other banking charges; and, further, the profit which accrues, with few exceptions, to the person with whom the speculation originates. Hence we must infer, that the par of exchange between these two countries, such as might be denominated with propriety a real par, or that which would, in fact, express the natural and absolute equivalence of a quantity of silver money in England to a quantity of money of the same metal in Spain, must be greater than the intrinsic par by the difference of the whole of such expenses; that the silver itself, traced from its source to the period when it has reached its destination, has in reality acquired an augmentation of value; and, lastly, that there is a difference of about 11 per cent, being the amount of the charges enumerated above, between the value of an ounce of fine silver at Cadiz, and that of an ounce of fine silver at London.

The principles which we have just analysed are equally applicable to the consideration of the intrinsic par between Portugal and England, as arising from the commerce between the two countries, and by which the latter is supplied with the materials for its gold coinage.

Again: considering that the intrinsic par is not of that practical applicability to the operations of commerce to be at any time the basis of speculations; that authors vary in the pars which they have given; and that those admitted in business are almost all incorrect; I shall conclude, without enlarging upon any imaginary notions which may have been formed of the mean intrinsic par, that it is from error alone that it can have derived its importance as the fancied expression of the most exact relative value of the monies of two countries; and that, as the par of exchange is not the same when considered in respect to the monies of gold as when it is considered in respect to the monies of silver, the distinction should be therefore preserved.

#### OF THE CALCULATION OF THE INTRINSIC PAR.

The intrinsic par is in general calculated by a comparison of the pure contents of two coins of the same metal, appertaining to dif-



ferent countries ; and by a comparison of the value at which each is respectively admitted in circulation, in consequence of regulations by government.

The following proposition will serve to shew the method of ascertaining the weight, the standard, and the pure contents of any foreign coin, in order to determine the par of exchange between two countries, according to the pure contents of the same coin comparatively with the pure contents of a coin of another country, and according to the current value of each.

**PROPOSITION.**

Required to know the weight and standard, by the English computation, as well as the pure contents, of a piece of gold of 40 francs.

*To find the Weight.*

Observing that the piece in question weighs 12,90 grammes of France, each of which is equivalent to 18,83 grains of France, and that 7021 grains of France correspond with 5760 grains of England, I shall determine the English weight of the piece of 40 francs by the following equation :

$$\begin{array}{rcl}
 & & 1 \text{ piece} = 199,25 \text{ grains} \\
 1 \text{ piece} & = & 12,90 \text{ grammes} \\
 1 \text{ gramme} & = & 18,83 \text{ grains} \\
 7021 \text{ grains French} & = & 5760 \text{ grains English.}
 \end{array}$$

*To find the Standard.*

I have now to ascertain the English standard of the same piece of gold of 40 francs, which contains nine parts of fine and one part of alloy ; that is, wishing to know by how many carat-grains it may be better or worse than the English standard, I shall state the following proportion :

$10 : 9 :: 96 \text{ carat-grains} : x,$   
 and the result, which is  $86\frac{2}{3}$ , denotes that the standard of the piece abovementioned is  $1\frac{2}{3}$  carat-grains worse than the standard of regulation, which is 88 carat-grains.

*To find the pure Contents.*

Having ascertained by the first equation that the piece in question weighs 199,25 grains troy-weight, I seek its pure con-



tents, either according to the French standard, by the following proportion,

$$10 : 9 :: 199,25 \text{ grains} : x,$$

or, according to the English standard, by the under mentioned,

$$96 : 86\frac{1}{2} :: 199,25 \text{ grains} : x;$$

and the result of each of these proportions, being necessarily alike, denotes that the piece contains 179,32 grains of pure metal, English weight.

After having ascertained the pure contents of this piece of 40 francs, and knowing that the pure contents of the guinea amount to 118,65 grains, I determine the par of exchange by the following equation, comprehending the current value of the two pieces respectively, and in which the first term of the dividend is the certain price of the exchange.

|                    |   |                        |
|--------------------|---|------------------------|
|                    |   | 1 pound sterling = $x$ |
| 1 pound sterling   | = | 20 shillings           |
| 21 shillings       | = | 1 guinea               |
| 1 guinea           | = | 118,65 grains fine     |
| 179,32 grains fine | = | 40 franc piece.        |

The issue denotes that the par of exchange between France and England, resulting from a comparison of their respective gold coins, is 25,21 ; that is, that a pound sterling is equal to 25 francs 21 cents.

The intrinsic par may be also calculated by first determining the par of coins between two different countries ; that is, the value, in the money of one country, of a piece of another country. The following example will denote the method to be followed.

#### TO FIND THE PAR OF COINS.

##### FIRST EXAMPLE.

Required to know the value in sterling of the meya dobra or Joanes of Portugal, weighing  $221\frac{7}{8}$  grains troy-weight, and being of the standard of 22 carats, by comparison with the guinea, which is also of that standard, but of which the weight is of  $129\frac{7}{16}$  grains.

*Equation.*

|                          |   |                         |
|--------------------------|---|-------------------------|
|                          |   | 1 Joanes = 36 shillings |
| 1 Joanes                 | = | $221\frac{7}{8}$ grains |
| $129\frac{7}{16}$ grains | = | 1 guinea                |
| 1 guinea                 | = | 21 shillings.           |



## SECOND EXAMPLE.

What is the value in sterling of a ducat of Hamburg or of Holland, of the standard of  $23\frac{1}{2}$  carats, and the weight of which is equal to  $53\frac{1}{2}$  grains troy-weight, by comparison with the guinea of the standard of 22 carats, and the weight of which is equal to  $129\frac{1}{16}$  grains?

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ ducat} = 9 \text{ shillings } 4 \text{ pence} \\
 1 \text{ ducat} & = & 53\frac{1}{2} \text{ grains } \frac{4}{8} \text{ fine} \\
 44 \text{ grains } \frac{4}{8} \text{ fine} & = & 47 \text{ grains } \frac{4}{8} \text{ fine} \\
 129\frac{1}{16} \text{ grains } \frac{4}{8} \text{ fine} & = & 1 \text{ guinea} \\
 1 \text{ guinea} & = & 21 \text{ shillings.}
 \end{array}$$

Whence it follows, that, to find the par of coins, it is requisite to place the piece of which the value be sought, as the first term in the dividend of an equation whose last term be of the denomination of the money into which it be intended to reduce such piece.

## TO FIND THE PAR OF EXCHANGE.

## FIRST EXAMPLE.

Required the par of exchange between London and Lisbon, the Joanes being worth 6400 reis and 36 shillings respectively.

*Equation.*

$$\begin{array}{rcl}
 & & 1000 \text{ reis} = 67\frac{1}{2} \text{ pence} \\
 6400 \text{ reis} & = & 36 \text{ shillings} \\
 1 \text{ shilling} & = & 12 \text{ pence.}
 \end{array}$$

## SECOND EXAMPLE.

Required the par of exchange between London and Hamburg, the ducat being worth 6 marcs banco and 9 shillings 4 pence sterling respectively.

*Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ pound sterling} = 34\frac{1}{4} \text{ shillings Flemish banco} \\
 1 \text{ pound} & = & 20 \text{ shillings} \\
 9\frac{1}{4} \text{ shillings} & = & 1 \text{ ducat} \\
 1 \text{ ducat} & = & 6 \text{ marcs banco} \\
 3 \text{ marcs} & = & 8 \text{ shillings Flemish.}
 \end{array}$$

Whence it follows, that, to find the par of exchange, after having first determined the par of coins, it is requisite to place the certain price of the exchange as the first term of the dividend in an equation whose last term be of the denomination of the uncertain price.

The two methods which I have just pointed out, and the tables of gold and silver coins which will be found in a subsequent part of this work, will serve for the determination of all such pars of ex-



change as have not been comprehended under the present head, and which are determined by means of a single equation, founded upon the successive comparison of the gold and silver coins, in respect to their weight, standard, and current value.

I have now to speak of the eventual par; but before I proceed to this part of my subject, I shall beg leave to point out to my readers the strange error existing in almost all the tables of monies published in this country, and which is even rather generally adopted in business, namely, that 24 livres tournois are equal to 1 pound sterling, which would induce a supposition that the *écu de six livres* of France were equivalent to the English crown, notwithstanding that the weight and standard of the former be inferior to those of the latter; and that, according to the pars which I have determined, and of which the correctness may be verified, the pound sterling would be worth 25 livres 5 sols 10 deniers tournois, or 24 francs 98 cents, admitting the existence of a mean par as the result of the two intrinsic pars.

#### OF THE EVENTUAL PAR.

The expression of eventual par is intended to convey an idea of a par of exchange between two countries, which is determined by deducting from, or adding to, the intrinsic par the difference arising either from the discount obtaining upon paper money by reason of its forced circulation, or from the agio allowed upon effective coins in gold and silver, which are the elements of the formation of the intrinsic par.

The following examples will shew the method to be followed in order to find the eventual par.

#### FIRST EXAMPLE.

The intrinsic par between London and Lisbon which results from the comparison of the monies of gold being  $67\frac{1}{2}$ , what is the eventual par between those places, while the discount is at 12 per cent upon paper money at Lisbon?

#### Solution.

As payments are made, in Portugal, half in cash, and half in paper money, it is evident that, to find the eventual par, the intrinsic par is to be reduced by only half the discount upon paper money; wherefore

$$100 \text{ reis legal} : 94 \text{ reis effective} :: 67\frac{1}{2} \text{ pence} : x, \\ \text{result } 63\frac{9}{20} \text{ pence.}$$



## SECOND EXAMPLE.

What is the eventual par between London and Venice, when the intrinsic par resulting from the comparison of the monies of gold is 46,28 lire piccoli per pound sterling, and the agio on zecchins at 35 per cent at Venice?

*Solution.*

The intrinsic par being determined according to the value of the zecchins, fixed at 22 lire piccoli, it is evident, that, if an agio be paid of 35 per cent upon the value of the zecchin, it becomes requisite, in order to obtain the eventual par, to add to the value of the intrinsic par being 46,28 lire piccoli, in the proportion of 100 to 135; wherefore

$$100 : 135 :: 46,28 \text{ lire piccoli} : x, \\ \text{result } 62,48 \text{ lire piccoli.}$$

According to the present quotation of the exchange of London upon Lisbon and Venice respectively, which accords pretty nearly with the results abovementioned, it is evident that, if the intrinsic par be the basis of the course of exchange between two countries in which payments are made in effective monies, the eventual par is a similar basis, when in any two countries, or in either of them, payments are not made in effective, or only partially in effective; and, under this point of view, the investigation of the eventual par becomes an object of utility.



## LONDON AND AMSTERDAM.

## GOLD COINS.

Required the intrinsic par of exchange between London and Amsterdam, resulting from the comparison of the guinea and the ducat.

*Equation.*

|                                           |                                               |
|-------------------------------------------|-----------------------------------------------|
|                                           | 1 pound sterling = $x$                        |
| 21 pounds sterling                        | = 20 guineas                                  |
| 1 guinea                                  | = $129\frac{7}{16}$ grains $\frac{4}{8}$ fine |
| 47 grains $\frac{4}{8}$ fine              | = 44 grains $\frac{4}{8}$ fine                |
| $53\frac{1}{2}$ grains $\frac{4}{8}$ fine | = 1 ducat                                     |
| 1 ducat                                   | = $4\frac{3}{4}$ florins banco                |
| 3 florins banco                           | = 10 shillings Flemish.                       |

*Result.*—1 pound sterling = 35 shillings  $6\frac{1}{2}$  grotes Flemish banco, or 35,54 shillings Flemish banco.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the ducatoon.

*Equation.*

|                                            |                                              |
|--------------------------------------------|----------------------------------------------|
|                                            | 1 pound sterling = $x$                       |
| 1 pound sterling                           | = 4 crowns                                   |
| 1 crown                                    | = $464\frac{1}{2}$ grains $\frac{2}{4}$ fine |
| 225 grains $\frac{2}{4}$ fine              | = 222 grains $\frac{2}{4}$ fine              |
| $503\frac{1}{2}$ grains $\frac{2}{4}$ fine | = 1 ducatoon                                 |
| 1 ducatoon                                 | = 3 florins banco                            |
| 3 florins banco                            | = 10 shillings Flemish.                      |

*Result.*—1 pound sterling = 36 shillings 5 grotes Flemish banco, or 36,41 shillings Flemish banco.

## LONDON AND FRANCE.

## GOLD COINS.

Required the intrinsic par of exchange between London and France, resulting from the comparison of the guinea and the louis coined since 1785.

*Equation.*

|                                            |                                               |
|--------------------------------------------|-----------------------------------------------|
|                                            | 1 pound sterling = $x$                        |
| 21 pounds sterling                         | = 20 guineas                                  |
| 1 guinea                                   | = $129\frac{7}{16}$ grains $\frac{6}{8}$ fine |
| 65 grains $\frac{6}{8}$ fine               | = 66 grains $\frac{6}{8}$ fine                |
| $117\frac{5}{6}$ grains $\frac{6}{8}$ fine | = 1 louis                                     |
| 1 louis                                    | = 24 livres tournois.                         |

*Result.*—1 pound sterling = 25 livres 9 sols  $10\frac{2}{3}$  deniers tournois, or 25 francs 18 cents.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the English and French crowns.

*Equation.*

|                                             |                                               |
|---------------------------------------------|-----------------------------------------------|
|                                             | 1 pound sterling = $x$                        |
| 1 pound sterling                            | = 4 English crowns                            |
| 1 English crown                             | = $464\frac{1}{2}$ grains $\frac{1}{20}$ fine |
| 109 grains $\frac{1}{20}$ fine              | = 111 grains $\frac{1}{20}$ fine              |
| $452\frac{1}{2}$ grains $\frac{1}{20}$ fine | = 1 French crown                              |
| 1 French crown                              | = 6 livres tournois.                          |

*Result.*—1 pound sterling = 25 livres 1 sol  $9\frac{1}{3}$  deniers tournois, or 24 francs 78 cents.



## LONDON AND FRANCE.

## GOLD COINS.

Required the intrinsic par of exchange between London and France, resulting from the comparison of the guinea and the new piece of 40 francs.

*Equation.*

|                                              |   |                                               |
|----------------------------------------------|---|-----------------------------------------------|
|                                              |   | 1 pound sterling = $x$                        |
| 21 pounds sterling                           | = | 20 guineas                                    |
| 1 guinea                                     | = | $129\frac{7}{16}$ grains $\frac{55}{80}$ fine |
| 54 grains $\frac{55}{80}$ fine               | = | 55 grains $\frac{54}{80}$ fine                |
| $199\frac{1}{4}$ grains $\frac{54}{80}$ fine | = | 40 franc piece.                               |

*Result.* 1 pound sterling = 25 francs 21 cents.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the new piece of 5 francs.

*Equation.*

|                                              |   |                                              |
|----------------------------------------------|---|----------------------------------------------|
|                                              |   | 1 pound sterling = $x$                       |
| 1 pound sterling                             | = | 4 crowns                                     |
| 1 crown                                      | = | $464\frac{1}{2}$ grains $\frac{37}{40}$ fine |
| 36 grains $\frac{37}{40}$ fine               | = | 37 grains $\frac{36}{40}$ fine               |
| $386\frac{1}{8}$ grains $\frac{36}{40}$ fine | = | 5 franc piece.                               |

*Result.* 1 pound sterling = 24 francs 73 cents.

## LONDON AND GENOA.

## GOLD COINS.

Required the intrinsic par of exchange between London and Genoa, resulting from the comparison of the guinea and the zecchin.

*Equation.*

|                                                 |   |                                               |
|-------------------------------------------------|---|-----------------------------------------------|
|                                                 |   | 1 pezza fuori di banco = $x$                  |
| 1 pezza fuori di banco                          | = | $5\frac{3}{4}$ lire ditto                     |
| $13\frac{1}{2}$ lire ditto                      | = | 1 zecchin                                     |
| 1 zecchin                                       | = | $53\frac{1}{2}$ grains $\frac{191}{192}$ fine |
| 176 grains $\frac{191}{192}$ fine               | = | 191 grains $\frac{176}{192}$ fine             |
| $129\frac{7}{16}$ grains $\frac{176}{192}$ fine | = | 1 guinea                                      |
| 1 guinea                                        | = | 252 pence sterling.                           |

*Result.* 1 pezza fuori di banco = 48,41 pence sterling.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the genovina.

*Equation.*

|                                                |   |                                                 |
|------------------------------------------------|---|-------------------------------------------------|
|                                                |   | 1 pezza fuori di banco = $x$                    |
| 1 pezza fuori di banco                         | = | $5\frac{3}{4}$ lire ditto                       |
| $9\frac{1}{2}$ lire ditto                      | = | 1 genovina                                      |
| 1 genovina                                     | = | $593\frac{1}{10}$ grains $\frac{229}{240}$ fine |
| 222 grains $\frac{229}{240}$ fine              | = | 229 grains $\frac{222}{240}$ fine               |
| $464\frac{1}{2}$ grains $\frac{222}{240}$ fine | = | 1 crown                                         |
| 1 crown                                        | = | 60 pence sterling.                              |

*Result.* 1 pezza fuori di banco = 47,83 pence sterling.



## LONDON AND HAMBURG.

## GOLD COINS.

Required the intrinsic par of exchange between London and Hamburg, resulting from the comparison of the guinea and the ducat.

*Equation.* 1 pound sterling =  $x$

21 pounds sterling = 20 guineas

1 guinea =  $129\frac{7}{16}$  grains  $\frac{44}{8}$  fine

47 grains  $\frac{44}{8}$  fine = 44 grains  $\frac{47}{8}$  fine

$53\frac{1}{16}$  grains  $\frac{47}{8}$  fine = 1 ducat

1 ducat = 6 marcs banco

3 marcs banco = 8 shillings Flemish.

*Result.*—1 pound sterling = 34 shillings  $3\frac{1}{2}$  grotes Flemish banco, or 34,29 shillings Flemish banco.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the marc banco.

*Equation.*

1 pound sterling =  $x$

1 pound sterling = 4 crowns

$12\frac{2}{5}$  crowns = 5328 grains fine

3608 grains fine = 1 marc fine

1 marc fine =  $27\frac{5}{8}$  marcs banco

3 marcs banco = 8 shillings Flemish.

*Result.*—1 pound sterling = 35 shillings 1 grote Flemish banco, or 35,09 shillings Flemish banco.

## LONDON AND LEGHORN.

## GOLD COINS.

Required the intrinsic par of exchange between London and Leghorn, resulting from the comparison of the guinea and the ruopono.

*Equation.*

1 pezza of 8 reals =  $x$

1 pezza of 8 reals =  $5\frac{3}{4}$  lire moneta buona

40 lire moneta buona = 1 ruopono

1 ruopono =  $161\frac{1}{3}$  grains  $\frac{287}{288}$  fine

264 grains  $\frac{287}{288}$  fine = 287 grains  $\frac{287}{288}$  fine

$129\frac{7}{16}$  grains  $\frac{287}{288}$  fine = 1 guinea

1 guinea = 252 pence.

*Result.* 1 pezza of 8 reals = 49,09 pence sterling.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the francescono.

*Equation.*

1 pezza of 8 reals =  $x$

1 pezza of 8 reals =  $5\frac{3}{4}$  lire moneta buona

$6\frac{2}{3}$  lire moneta buona = 1 francescono

1 francescono =  $422\frac{3}{4}$  grains  $\frac{110}{120}$  fine

111 grains  $\frac{110}{120}$  fine = 110 grains  $\frac{110}{120}$  fine

$464\frac{1}{2}$  grains  $\frac{110}{120}$  fine = 1 crown

1 crown = 60 pence.

*Result.* 1 pezza of 8 reals = 46,67 pence sterling.



## LONDON AND NAPLES.

## GOLD COINS.

Required the intrinsic par of exchange between London and Naples, resulting from the comparison of the guinea and the onza.

*Equation.*

$$\begin{aligned}
 &1 \text{ ducat di regno} = x \\
 &3 \text{ ducats di regno} = 1 \text{ onza} \\
 &1 \text{ onza} = 68\frac{1}{10} \text{ grains } \frac{21}{4} \text{ fine} \\
 &22 \text{ grains } \frac{21}{4} \text{ fine} = 21 \text{ grains } \frac{22}{4} \text{ fine} \\
 &129\frac{1}{10} \text{ grains } \frac{22}{4} \text{ fine} = 1 \text{ guinea} \\
 &1 \text{ guinea} = 252 \text{ pence.}
 \end{aligned}$$

*Result.* 1 ducat di regno = 42,19 pence sterling.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the ducat di regno.

*Equation.*

$$\begin{aligned}
 &1 \text{ ducat di regno} = x \\
 &1 \text{ ducat di regno} = 336 \text{ grains } \frac{210}{40} \text{ fine} \\
 &222 \text{ grains } \frac{210}{40} \text{ fine} = 219 \text{ grains } \frac{220}{40} \text{ fine} \\
 &464\frac{1}{2} \text{ grains } \frac{220}{40} \text{ fine} = 1 \text{ crown} \\
 &1 \text{ crown} = 60 \text{ pence}
 \end{aligned}$$

*Result.* 1 ducat di regno = 42,81 pence sterling.

## LONDON AND PORTUGAL.

## GOLD COINS.

Required the intrinsic par of exchange between London and Portugal, resulting from the comparison of the guinea and the Joanesé.

*Equation.*

$$\begin{aligned}
 &1000 \text{ reis} = x \\
 &6400 \text{ reis} = 1 \text{ Joanesé} \\
 &1 \text{ Joanesé} = 221\frac{1}{8} \text{ grains } \frac{11}{2} \text{ fine} \\
 &129\frac{7}{16} \text{ grains } \frac{11}{2} \text{ fine} = 1 \text{ guinea} \\
 &1 \text{ guinea} = 252 \text{ pence sterling.}
 \end{aligned}$$

*Result.* Milreis = 67,50 pence sterling.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the crusade coined since 1750.

*Equation.*

$$\begin{aligned}
 &1000 \text{ reis} = x \\
 &480 \text{ reis} = 1 \text{ crusade} \\
 &1 \text{ crusade} = 265\frac{13}{20} \text{ grains } \frac{431}{80} \text{ fine} \\
 &444 \text{ grains } \frac{431}{80} \text{ fine} = 431 \text{ grains } \frac{444}{80} \text{ fine} \\
 &464\frac{1}{2} \text{ grains } \frac{444}{80} \text{ fine} = 1 \text{ crown} \\
 &1 \text{ crown} = 60 \text{ pence.}
 \end{aligned}$$

*Result.* Milreis = 69,40 pence sterling.



## LONDON AND ROTTERDAM.

## GOLD COINS.

Required the intrinsic par of exchange between London and Rotterdam, resulting from the comparison of the guinea and the ryder.

|                  |                                                |                                               |
|------------------|------------------------------------------------|-----------------------------------------------|
| <i>Equation.</i> |                                                | 1 pound sterling = $x$                        |
|                  | 21 pounds sterling =                           | 20 guineas                                    |
|                  | 1 guinea =                                     | $129\frac{7}{16}$ grains $\frac{11}{12}$ fine |
|                  | $153\frac{1}{2}$ grains $\frac{11}{12}$ fine = | 1 ryder                                       |
|                  | 1 ryder =                                      | 14 florins current.                           |
| <i>Result.</i>   | 1 pound sterling =                             | 11,24 florins current.                        |

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the florin.

|                  |                                               |                                            |
|------------------|-----------------------------------------------|--------------------------------------------|
| <i>Equation.</i> |                                               | 1 pound sterling = $x$                     |
|                  | 1 pound sterling =                            | 4 crowns                                   |
|                  | 1 crown =                                     | $464\frac{1}{2}$ grains $\frac{7}{8}$ fine |
|                  | 73 grains $\frac{7}{8}$ fine =                | 74 grains $\frac{7}{8}$ fine               |
|                  | $162\frac{7}{10}$ grains $\frac{7}{8}$ fine = | 1 florin current.                          |
| <i>Result.</i>   | 1 pound sterling =                            | 11,58 florins current.                     |

## LONDON AND SPAIN.

## GOLD COINS.

Required the intrinsic par of exchange between London and Spain, resulting from the comparison of the guinea and the doubloon coined since 1785.

|                  |                                               |                                            |
|------------------|-----------------------------------------------|--------------------------------------------|
| <i>Equation.</i> |                                               | 1 dollar of exchange = $x$                 |
|                  | 1 dollar of exchange =                        | 8 reals of plate                           |
|                  | 170 reals of plate =                          | 1 doubloon                                 |
|                  | 1 doubloon =                                  | $416\frac{1}{2}$ grains $\frac{4}{8}$ fine |
|                  | 44 grains $\frac{4}{8}$ fine =                | 43 grains $\frac{4}{8}$ fine               |
|                  | $129\frac{7}{16}$ grains $\frac{4}{8}$ fine = | 1 guinea                                   |
|                  | 1 guinea =                                    | 252 pence sterling.                        |
| <i>Result.</i>   | 1 dollar of exchange =                        | 37,30 pence sterling.                      |

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the hard dollar coined since 1772.

|                  |                                              |                                            |
|------------------|----------------------------------------------|--------------------------------------------|
| <i>Equation.</i> |                                              | 1 dollar of exchange = $x$                 |
|                  | 85 dollars of exchange =                     | 64 hard dollars                            |
|                  | 1 hard dollar =                              | $416\frac{2}{3}$ grains $\frac{2}{4}$ fine |
|                  | 222 grains $\frac{2}{4}$ fine =              | 215 grains $\frac{2}{4}$ fine              |
|                  | $464\frac{1}{2}$ grains $\frac{2}{4}$ fine = | 1 crown                                    |
|                  | 1 crown =                                    | 60 pence.                                  |
| <i>Result.</i>   | 1 dollar of exchange =                       | 39,22 pence sterling.                      |



## LONDON AND VENICE.

## GOLD COINS.

Required the intrinsic par of exchange between London and Venice, resulting from the comparison of the guinea and the zecchin.

*Equation.*

1 pound sterling =  $x$

21 pounds sterling = 20 guineas

1 guinea =  $129\frac{7}{16}$  grains  $\frac{176}{192}$  fine

191 grains  $\frac{176}{192}$  fine = 176 grains  $\frac{181}{192}$  fine

54 grains  $\frac{181}{192}$  fine = 1 zecchin

1 zecchin = 22 lire piccoli.

*Result.*

1 pound sterling = 46,28 lire piccoli.

## SILVER COINS.

Required the intrinsic par resulting from the comparison of the crown and the ducat.

*Equation.*

1 pound sterling =  $x$

1 pound sterling = 4 crowns

1 crown =  $464\frac{1}{2}$  grains  $\frac{37}{40}$  fine

33 grains  $\frac{37}{40}$  fine = 37 grains  $\frac{33}{40}$  fine

350 $\frac{5}{8}$  grains  $\frac{33}{40}$  fine = 1 ducat

1 ducat = 8 lire piccoli.

*Result.*

1 pound sterling = 47,50 lire piccoli.



OF  
**PRACTICAL SPECULATIONS**

IN  
**Merchandize.**

**FROM** the consideration of the several calculations regarding exchanges, operations in bullion and specie, and pars of exchange and of coins, I shall now proceed to treat of those which relate to speculations in merchandize. Such calculations are directed to the discovery of the price at which any kind of merchandize may stand in, whether imported or exported, in order that, by comparing that price with actual quotations, we may determine the profit per cent which will result from the purchase of merchandize at one place, and the sale of it in another.

Calculations of merchandize are much more complicated in elementary matter than those which I have hitherto described; and, in fact, to resolve them with precision, it is necessary to know the following data between two contracting places.

- 1st, The actual price of the goods, the money in which it is stipulated, and the customary terms of payment.
- 2d, The mutual relation of the weights and measures.
- 3d, The rate of exchange at which the parties may remit, or may draw, and reciprocally.
- 4th, The duties, commissions, and brokerages, as well as the shipping charges payable upon exportation.
- 5th, The amount of freight, whether inwards or outwards, and of the premium of insurance and policy.
- 6th, The importation duties, charges of landing, commissions, and brokerages, as well as the charges for warehouse rent on importation.
- 7th, The difference which there may be between the tares and other allowances at the place of purchase, and the corresponding allowances at the place of sale.

It is no less essential to consider, at the same time, the unavoidable decrease from the weight or from the contents of the



goods, occasioned by their conveyance, as well as the interest of the funds employed either in the purchase of the goods, or in the payment of the freight, of the premium of insurance, and of the duties upon exportation and importation respectively, from the time of the disbursement of such funds to that of the sale of the goods, or to the period of the receipt of the amount of such sale.

The consideration of the abovementioned data will lead, in general, to correct results upon which speculations may be grounded; observing, however, that, as several of the component parts of these calculations are subject to variations which cannot always be foreseen, it would be imprudent to engage in those operations which might not afford a prospect of greater profit by calculation, than that resulting from arbitrations of exchange, or from operations in bullion and specie; and it would be still more imprudent to undertake speculations on certain goods, such as corn, fish, salt, flour, seed, fruit, and liquids, without a previous consideration of the greater susceptibility of such goods to damage or to leakage, the amount of which is so seldom recovered by the merchants from the insurers.

It will be chiefly in calculations of merchandize that the use will be felt of the rule of equation which I have uniformly employed in the course of this work; and the same rule will enable the calculator to obtain, in respect to every kind of merchandize, results strictly conformable to those which would ensue from the comparison of Invoices and of Accounts of Sale, whether real or simulate, at the same time that, by the application of logarithms, the longest calculations may be reduced to the simple operations of addition and of subtraction.

In order to determine the equation resulting from the analysis of each proposition, it will be always necessary to place, as the first term of the dividend, the description of goods of which the price be required, observing in all cases either to include the charges in the dividend, or to add them to the result; since, as the price of the commodity purchased must be necessarily augmented in proportion to the charges to be paid to the time of sale, the numerical result must be also higher.

The application of logarithms is to be effected by first adding the logarithms of the invariable numbers of the dividend and of the divisor respectively; and, by subtracting the smaller sum from



the larger, the difference will be a fixed logarithm to be employed in all the operations of the same kind, with the logarithms of the variable numbers in each equation.

As the calculations which may be made in merchandize are innumerable, I shall confine myself to a few examples, sufficiently varied, however, to give a precise idea of the subject; and I shall begin with the description of a real transaction, in regard to a quantity of wheat sent from Dantzic to London for account of a merchant at Hamburg, and which will serve to shew that the results afforded by a rule of equation are the same as those which might be derived from the comparison of invoices and of real accounts of sale.

HAMBURG, October 12, 1804.

*Invoice of 56 lasts of wheat, in 1214 bags, shipped from Dantzic to London.*

|                                              |          |        |
|----------------------------------------------|----------|--------|
| 56 lasts wheat, at 620 florins per last..... | F. 34720 | 0      |
| 1214 bags and 20 mats .....                  | F. 1334  |        |
| Shipping charges at Dantzic .....            | 2934     |        |
|                                              | <hr/>    | 4268 0 |
|                                              | F. 38988 | 0      |

|                                        |               |            |
|----------------------------------------|---------------|------------|
| Drawn on Hamburg F. 38988, at 166 .... | M.B. 21138    | 1          |
| Commission on 21138 1, at 2 per cent   | 422           | 12         |
| Insurance on 25000 .....               | 8             | do. 2000 0 |
| Commission on do. ....                 | $\frac{1}{3}$ | 83 5       |
| Brokerage on do. ....                  | $\frac{1}{4}$ | 62 8       |
| Policy.....                            | 6             | 0          |
|                                        | <hr/>         | 2574 9     |

M. B. 23712 10

LONDON, March 2, 1805.

*Account of sale, charges, and net proceeds, of 56 lasts of wheat, received from Dantzic.*

| Qrs. Bush.                            | SALE. |           |
|---------------------------------------|-------|-----------|
| 590 4, at 110 shillings per quarter.. | £3247 | 15 0      |
| Proceeds of bags and mats.....        | 37    | 9 0       |
|                                       | <hr/> | £3285 4 0 |

CHARGES.

|                                             |       |          |
|---------------------------------------------|-------|----------|
| Freight and port charges.....               | £229  | 14 9     |
| Entry, officers' and custom-house charges.. | 9     | 14 10    |
| Landing, and carriage to warehouse .....    | 32    | 17 0     |
| Sundry small charges.....                   | 5     | 5 0      |
| Factorage of 591 qrs, at 1s per quarter.... | 29    | 11 0     |
| Commission on 3285 4, at 2 per cent.....    | 65    | 14 0     |
|                                             | <hr/> | 372 16 7 |

Net proceeds due 5th April..... £2912 7 5



Upon inspection of the preceding invoice, it will be seen that the 56 lasts of wheat cost 38988 florins at Dantzic, inclusive of all charges; and that Dantzic obtained its reimbursement upon Hamburg by drawing 21138 marcs and 1 shilling banco, which, at the exchange of 166 groshen per rixdollar banco, are equivalent to 38988 florins, according to the calculation which I have given under the head of Operations of Exchange, p. 53. The cost of the same 56 lasts of wheat to the principal at Hamburg, is, inclusive of all charges, 23712 marcs and 10 shillings banco, which, at the rate of  $34\frac{1}{4}$  shillings Flemish banco per pound sterling, being the exchange of the day current at Hamburg upon London, were equivalent to £1846 4 9, and for the greater part of which Hamburg drew upon London.

The net proceeds of the 56 lasts of wheat at London being £2912 7 5, I shall determine the profit per cent arising from the operation by the following proportion:

$$£1846\ 4\ 9 : £2912\ 7\ 5 :: 100 : x;$$

the result of which being  $157\frac{3}{4}$ , denotes, that, in consequence of the considerable advance which took place at London on the price of corn, the operation in question left a net profit of  $57\frac{3}{4}$  per cent, exclusively of the consideration of the interest of the funds employed; and I shall now proceed to shew, that, by a single rule of equation, the same result may be obtained.

#### PROPOSITION.

A merchant at Hamburg directs his agent at Dantzic to purchase a quantity of wheat at 620 florins per last, drawing upon Hamburg for the amount, at the exchange of 166, and shipping the wheat for London: it is required to know at what price the wheat will stand in, when received at London, and what may be the profit per cent resulting from the operation; the exchange at Hamburg upon London being at  $34\frac{1}{4}$ , and the selling price of the wheat at London at 110 shillings per quarter.

Having to find the cost of a quarter, as received at London, I place 1 quarter as the first term of the dividend of the equation to be arranged, and I represent its equivalent in shillings by  $x$ , in the following manner:

$$1\ \text{quarter} = x.$$

Perceiving that 56 lasts, Dantzic measure, have rendered 590½



quarters at London, I determine the relation between the two measures by the following proportion :

$$56 \text{ lasts} : 590\frac{1}{2} \text{ quarters} :: 1 \text{ last} : x ;$$

the result of which, or 10,545\*, denotes that 1 last of Dantzic has rendered 10,545 quarters at London ; wherefore I say,

$$\begin{array}{l} 1 \text{ quarter} = x \\ 10,545 \text{ quarters} = 1 \text{ last.} \end{array}$$

The first cost of the wheat at Dantzic being 620 florins per last, I say

$$\begin{array}{l} 1 \text{ quarter} = x \\ 10,545 \text{ quarters} = 1 \text{ last} \\ 1 \text{ last} = 620 \text{ florins.} \end{array}$$

Proceeding to examine the invoice from Hamburg, I perceive that the charges at Dantzic amount to 4268 florins ; and by realizing the following proportion,

$$F. 34720 : F. 4268 :: 100 : x,$$

I conclude by the result, which is  $12\frac{7}{4}$ , that the prime cost of the last at Dantzic was augmented by the charges in the proportion of 100 to  $112\frac{7}{4}$  ; wherefore I say,

$$\begin{array}{l} 10,545 \text{ quarters} = 1 \text{ last} \\ 1 \text{ last} = 620 \text{ florins} \\ 100 \text{ florins with charges} \dots\dots = 112\frac{7}{4} \text{ florins.} \end{array}$$

If I were to pause in the course of this operation, and were desirous of ascertaining the price at which a quarter might have stood in at Dantzic, inclusive of every charge, I should find, by multiplying 620 by  $112\frac{7}{4}$ , and by dividing the product by 1054 $\frac{1}{2}$ , that the quarter would be exactly equivalent to  $66\frac{1}{40}$  florins. Again ; observing by the invoice that 590 $\frac{1}{2}$  quarters have cost 38988 florins, I should find, by the following proportion,

$$590\frac{1}{2} \text{ quarters} : 38988 \text{ florins} :: 1 \text{ quarter} : x,$$

the exact equivalence, in like manner, of 1 quarter to  $66\frac{1}{40}$  florins, being precisely the same result as the former.

Resuming the consideration of the proposition, and perceiving that Dantzic is ordered to draw upon Hamburg at 166 groshen per rixdollar banco, I reduce the florins into groshen by opposing

\* This quantity corresponds very nearly with  $10\frac{11}{20}$ , and I have expressed it by decimals, for the purpose of greater exactness in the analysis of the operation.



1 to 30: I reduce the groshen into rixdollars banco by opposing 166 to 1; and, lastly, I bring the rixdollars banco into marcs banco by opposing 1 to 3.

Proceeding to examine the invoice from Hamburg, I perceive that the usual charges of commission, &c. introduced by the principal, amount to 2574 marcs and 9 shillings; and by stating the following proportion,

$$\text{M. B. 21138 } 1 : \text{M. B. 2574 } 9 :: 100 : x,$$

which affords a result of  $12\frac{3}{16}$ , I conclude that the cost of the wheat was virtually augmented at Hamburg, by reason of the charges, in the proportion of 100 to  $112\frac{3}{16}$ ; wherefore, by uniting the partial equations abovementioned, I say,

|        |                      |                                    |
|--------|----------------------|------------------------------------|
|        |                      | $1 \text{ quarter} = x$            |
| 10,545 | quarters             | $= 1 \text{ last}$                 |
| 1      | last                 | $= 620 \text{ florins}$            |
| 100    | florins with charges | $= 112\frac{7}{8} \text{ florins}$ |
| 1      | florin               | $= 30 \text{ groshen}$             |
| 166    | groshen              | $= 1 \text{ rixdollar}$            |
| 1      | rixdollar            | $= 3 \text{ marcs}$                |
| 100    | marcs with charges   | $= 112\frac{3}{16} \text{ marcs.}$ |

If I were to pause a second time in the course of this operation, and were desirous of knowing at what price a quarter would stand in at Hamburg, inclusive of all charges, I should inter-multiply the terms of the dividend, and divide their product by the product of the inter-multiplication of the terms of the divisor, whence I should find the exact equivalence of the quarter to  $40\frac{5}{8}$  marcs banco; and observing, in like manner, by the invoice, that 590 $\frac{1}{2}$  quarters have cost 23712 $\frac{1}{2}$  marcs banco, I should obtain, by the following proportion,

$$590\frac{1}{2} \text{ quarters} : 23712\frac{1}{2} \text{ marcs} :: 1 \text{ quarter} : x,$$

the same result of  $40\frac{5}{8}$  marcs banco; being the second instance of coincidence.

Pursuing the operation, and perceiving by the proposition that the exchange at Hamburg upon London is at  $34\frac{1}{4}$  shillings Flemish banco per pound sterling, I reduce the marcs banco into shillings Flemish banco, by opposing 3 to 8, and I afterwards reduce the shillings Flemish banco into pounds sterling by opposing  $34\frac{1}{4}$  to 1. Observing further, by the account of sale at London, that 590 $\frac{1}{2}$  quarters at 110 shillings have produced



£3247 15, and that the charges at London amount to £372 16 7, I state the following proportion,

$$£3247\ 15 : £372\ 16\ 7 :: 100 : x,$$

by the result of which, being  $11\frac{1}{2}$ , I conclude that the price of the wheat has been augmented at London, by reason of the charges, in the proportion of 100 to  $111\frac{1}{2}$ . Hence I oppose 100 pounds sterling, with the charges, to  $111\frac{1}{2}$  pounds sterling; and as the quarter of wheat is sold at London for a certain number of shillings, I reduce the pounds into shillings by opposing 1 to 20, determining ultimately the following equation:

|                 |                      |                                       |
|-----------------|----------------------|---------------------------------------|
|                 |                      | 1 quarter = $x$                       |
| 10,545          | quarters             | = 1 last                              |
| 1               | last                 | = 620 florins                         |
| 100             | florins with charges | = $112\frac{7}{8}$ florins at Dantzic |
| 1               | florin               | = 30 groshen                          |
| 166             | groshen              | = 1 rixdollar                         |
| 1               | rixdollar            | = 3 marcs                             |
| 100             | marcs with charges   | = $112\frac{3}{16}$ marcs at Hamburg  |
| 3               | marcs                | = 8 shillings Flemish                 |
| $34\frac{1}{4}$ | shillings Flemish    | = 1 pound sterling                    |
| 100             | pounds with charges  | = $111\frac{1}{2}$ pounds at London   |
| 1               | pound sterling       | = 20 shillings sterling.              |

Upon examination of this equation, I perceive that the only variable terms are the price of the last of wheat at Dantzic, the rate of exchange at Dantzic upon Hamburg, and that at Hamburg upon London. It is true that the terms of the dividend, which comprise the charges at Dantzic, at Hamburg, and at London, might be considered as variable terms; but as the variation in those charges in respect to other accounts would be limited, it might be easily accounted for in the general result of the operation; wherefore, after having suppressed the number 3, which is in each column, I shall proceed to add the logarithms of the invariable numbers of the dividend and of the divisor, respectively, in order to determine, by the subtraction of the smaller sum from the greater, the fixed logarithm to be employed with the logarithms of the variable numbers which I have already mentioned, both in this and in any similar operation.



*Solution by Logarithms.*

## DIVIDEND.

## Invariable Numbers.

|                              |   |        |
|------------------------------|---|--------|
| 112 $\frac{7}{24}$ florins.. | = | 205035 |
| 30 groshen....               | + | 147712 |
| 112 $\frac{3}{16}$ marcs...  | + | 204994 |
| 8 shillings...               | + | 90309  |
| 111 $\frac{1}{2}$ pounds...  | + | 204727 |
| 20 shillings ...             | + | 130103 |
|                              |   | <hr/>  |
|                              |   | 982880 |

## DIVISOR.

## Invariable Numbers.

|                               |   |        |            |
|-------------------------------|---|--------|------------|
| 10,541 $\frac{1}{2}$ quarters | = | 102304 |            |
| 100 florins.                  | + | 2..... | } — 702304 |
| 100 marcs.                    | + | 2..... |            |
| 100 pounds                    | + | 2..... |            |

Fixed logarithm ..... 280576

Price at Dantzic, 620 florins.. + 279239

---

559815

Dantzic on Hamburg 166 = 222011 } — 375477

Hamburg on London 34 3 + 153466 }

Cost of 1 quarter at London 69 $\frac{2}{4}$  shillings = 184338Rate per cent of profit..... 57 $\frac{3}{4}$ ..... + 19801

---

Price of 1 quarter at London 110 shillings = 204139

It will be seen by the preceding solution, that, after having respectively added the logarithms of the invariable numbers of the dividend and of the divisor, I have deducted the sum of the logarithms of the divisor from that of the dividend, the latter being the greater. I have by this means obtained, in the dividend of the equation, a fixed logarithm of 280576, to which I have added the logarithm of 620 florins, being the cost of a last at Dantzic, and which is also a part of the same dividend. From the sum of these two logarithms, I have deducted the sum of the logarithms of the two courses of exchange, which are each a part of the divisor, and I have ultimately obtained the logarithm 184338, which corresponds with the natural number 69 $\frac{2}{4}$ , and therefore denotes that the wheat, when received at London, stands in at 69 $\frac{2}{4}$  shillings per quarter.

Observing, further, that the price of wheat at London is 110



shillings per quarter, I look to the table for the logarithm of 110, which I find to be 204139, and deducting therefrom 184338, being the logarithm of  $69\frac{2}{3}$ , there is a remainder of 19801. It now remains to find the profit per cent, for which purpose I look to the table, and proceeding from the number 100, or its logarithm 200000, I annex the characteristic of that logarithm to the left of 19801, being the logarithm of the difference, and I find that the logarithm 219801 corresponds in the table with the natural number  $157\frac{3}{4}$ ; whence I infer that the profit resulting from the operation is at the rate of  $57\frac{3}{4}$  per cent, which is a result exactly similar to that which I had already obtained by the comparison of the real invoice and account of sale of the operation in question.

Such, then, is the effect of the application of logarithms to calculations of merchandize, that, after having determined a fixed logarithm in any operation whatever, we may readily deduce, from such quotations of exchange and of merchandize as we may receive, and simply by means of a small number of additions and of subtractions, which are of themselves easily verified, the price at which any kind of merchandize may stand in, and which could not be ascertained, by the ordinary means of multiplication and of division, without having recourse to calculations no less long than tedious.

The proposition which I have examined, and the calculations resulting from it, will be of guidance whenever an invoice and an account of sale, either real or simulate, may be under consideration with a view to the exportation of merchandize.

I shall now consider another proposition, which will be of guidance, in like manner, in respect to the importation of those articles of merchandize of which a real or a simulate invoice may have been furnished.

COGNAC, May 17, 1805.

*Invoice of four Puncheons Brandy, shipped at Charente for London.*

|                                   |                 |
|-----------------------------------|-----------------|
| 4 puncheons brandy, No. 1 . . . . | 72              |
| 2 . . . .                         | $69\frac{1}{4}$ |
| 3 . . . .                         | 67              |
| 4 . . . .                         | $67\frac{1}{4}$ |

---

275 $\frac{1}{2}$  velts.



|                                                       |           |
|-------------------------------------------------------|-----------|
| 27½ velts spirit of wine, at F. 285 per 27 velts..... | F. 290 18 |
| 248 velts brandy ..... 190 per ditto .....            | 1745 27   |

---

|            |            |
|------------|------------|
| 275½ velts | F. 2035 45 |
|------------|------------|

---

|                                                 |          |
|-------------------------------------------------|----------|
| Colouring F. 4 per 27 velts, box and samples .. | F. 44 81 |
|-------------------------------------------------|----------|

|                                               |      |
|-----------------------------------------------|------|
| Filling up on board 2 v. brandy, at 190 ..... | 14 7 |
|-----------------------------------------------|------|

---

58 88
*Charges.*

|                                |      |
|--------------------------------|------|
| Iron hoops, cooperage, &c..... | 72 0 |
|--------------------------------|------|

|                                                |       |
|------------------------------------------------|-------|
| Freight to Charente, and shipping charges..... | 42 47 |
|------------------------------------------------|-------|

---

114 47

---

F. 2208 80

|                                 |       |
|---------------------------------|-------|
| Commission, at 2 per cent ..... | 44 16 |
|---------------------------------|-------|

---

F. 2252 96

|                                                      |      |
|------------------------------------------------------|------|
| Carriage, &c. of money from Paris, 2 per cent* ..... | 45 4 |
|------------------------------------------------------|------|

---

F. 2298 0

## PROPOSITION.

Let it be premised that the price of a gallon of brandy at London be 4 shillings and 6 pence, before the payment of duties, or delivery on shore; the rate of exchange at Cognac upon London at 24 francs per pound sterling; the freight and primage from Charente to London equivalent to 6 per cent; and that the insurance may be effected at London at 3 guineas per cent: required the price at which a gallon of brandy will stand in at London, and what will be the profit per cent, according to the preceding invoice.

In order to resolve this proposition, which is directed to finding the price of a gallon of brandy, I place 1 gallon as the first term of the dividend of the equation to be arranged, representing by  $x$  its equivalent in shillings, in the following manner:

$$1 \text{ gallon of brandy} = x.$$

I now compare the measures used at London and at Cognac; and knowing that 16 velts of Cognac generally render 31 gallons, when sold at London, I say

$$\begin{array}{l} 1 \text{ gallon of brandy} = x \\ 31 \text{ gallons of London} = 16 \text{ velts of Cognac.} \end{array}$$

Proceeding to examine the invoice, I perceive that the quantity

\* A charge is made of 2 per cent for carriage of money, &c. from Paris to Cognac, the drafts upon London being usually sent to Paris to be negotiated, and for returns of the amount.



of  $275\frac{1}{2}$  velts, contained in the 4 puncheons, is composed of  $\frac{9}{10}$  brandy with  $\frac{1}{10}$  spirit of wine, which is always added to Cognac to render the whole of the degree of strength required for the sale at London; and as the spirit of wine is always sold at Cognac for half more than the brandy, I conclude that 9 velts of brandy and 1 velt of spirit of wine will cost the same price as  $10\frac{1}{2}$  velts of pure brandy. In fact, reckoning the amount of  $275\frac{1}{2}$  velts of pure brandy at the rate of 190 francs for 27 velts, I find the result to be 1938 francs 70 cents; and as the  $275\frac{1}{2}$  velts of mixture have cost, according to the invoice, 2035 francs 45 centimes, it is evident, by the following proposition,

$$F. 1938 \ 70 : F. 2035 \ 45 :: 10 : x,$$

the result of which is also  $10\frac{1}{2}$ , that 10 velts with  $\frac{1}{10}$  spirit of wine are equal to  $10\frac{1}{2}$  velts of brandy: thus, as the invoice shews that the cost of the brandy at Cognac was 190 francs per 27 velts, I say,

|                                     |                                   |
|-------------------------------------|-----------------------------------|
|                                     | 1 gallon of brandy = $x$          |
| 31 gallons of London                | = 16 velts of Cognac              |
| 10 velts with $\frac{1}{10}$ spirit | = $10\frac{1}{2}$ velts of brandy |
| 27 velts of brandy                  | = 190 francs.                     |

In order now to ascertain the proportion in which the price of the brandy has been augmented, to the time of its shipment inclusively, by the charges mentioned in the invoice, I state the following proportion,

$$F. 2035 \ 45 \text{ without charges} : F. 2298 \text{ with charges} :: 100 : x;$$

and the result, which is  $112\frac{7}{8}$ , denotes that 100 francs, with the charges, are equivalent to  $112\frac{7}{8}$  francs; and as it is stated in the proposition that the exchange at Cognac upon London is at 24 francs per pound sterling, while the brandy is sold at London at a certain number of shillings per gallon, I determine the following equation:

|                                     |                                   |
|-------------------------------------|-----------------------------------|
|                                     | 1 gallon of brandy = $x$          |
| 31 gallons of London                | = 16 velts of Cognac              |
| 10 velts with $\frac{1}{10}$ spirit | = $10\frac{1}{2}$ velts of brandy |
| 27 velts of brandy                  | = 190 francs                      |
| 100 francs with charges             | = $112\frac{7}{8}$ francs         |
| 24 francs                           | = 1 pound sterling                |
| 1 pound sterling                    | = 20 shillings sterling.          |

Upon examination of the preceding equation, I perceive that the only variable numbers are the cost of the brandy at Cognac, the rate of the exchange at Cognac upon London, and the amount of the charges to the time of shipment. For this reason I add the



logarithms of the numbers 31, 10, 27, and 100, which are comprised in the divisor, and are invariable, and I deduct from their sum that of the logarithms of the numbers 16,  $10\frac{1}{2}$ , and 20, which are comprised in the dividend, and are also invariable. The result is a fixed logarithm of 239638, remaining in the divisor, and to be employed in the solution of the present proposition, as well as in that of any other of a similar nature.

I now observe, by the terms of the proposition, that the freight and the primage are equivalent to 6 per cent, and that the insurance may be made at 3 guineas per cent; I shall reckon it, however, at 4 pounds per cent, on account of the difference between guineas and pounds sterling, of the charge for the policy and stamp, and also of the propriety of insuring a sum somewhat greater, in order to cover the risk; and estimating the brokerage and incidental charges at the port of London at  $\frac{5}{8}$  per cent, I add the logarithms of these several numbers,

|                         |                                   |            |             |
|-------------------------|-----------------------------------|------------|-------------|
| Freight and primage.... | 6                                 | per cent = | 2531        |
| Insurance .....         | 4                                 | ditto .. + | 1703        |
| Brokerage and charges.. | $\frac{5}{8}$                     | ditto .. + | 271         |
|                         | <u>10<math>\frac{5}{8}</math></u> |            | <u>4505</u> |

After having obtained these logarithms, according to the rule given in page 192, I observe, that, as the proceeds of the sale of the brandy in the port of London countervail the amount to be paid for the draft from Cognac, the consideration of the interest of the funds employed is reduced to the least consequence, for which reason I proceed to the solution, as follows :

*Solution by Logarithms.*

|                                                               |                   |   |               |
|---------------------------------------------------------------|-------------------|---|---------------|
| Price of the brandy at Cognac .....                           | 190               | = | 227875        |
| Aggregate charges till the time of shipment inclusively ..... | 112 $\frac{7}{8}$ | + | 205260        |
|                                                               |                   |   | <u>433135</u> |
| Fixed logarithm.....                                          | 239638            | } | — 377659      |
| Cognac on London .....                                        | 24 + 138021       |   |               |
| Cost on board .....                                           | 3 7               | = | 55476         |
| Aggregate charges .....                                       |                   | + | 4505          |
|                                                               |                   |   | <u>59981</u>  |
| Cost at London .....                                          | 34 $\frac{7}{8}$  | = | 59981         |
| Per centage of profit.....                                    | 13 $\frac{3}{2}$  | + | 5340          |
|                                                               |                   |   | <u>65321</u>  |
| Price of brandy at London .....                               | 4 6               | = | 65321         |



Hence, whenever an invoice of brandy may be received at London from Cognac, it will be sufficient to calculate the amount of the charges to the time of shipment inclusively, and to substitute to the logarithms beforementioned those of the natural numbers representing the actual cost of the brandy at Cognac, the amount of charges to the time of shipment inclusively, and the rate of the exchange, in order to ascertain the cost of the brandy on board, which will be expressed by a number corresponding with the logarithm resulting from the subtraction. By adding afterwards the same logarithm to the sum of the logarithms of the numbers representing the amount of the freight, of the insurance, and of the other charges, the aggregate will be found to be a logarithm corresponding with a number denoting the price at which the brandy will stand in at London.

Again: by looking in the table for the logarithm of the actual selling price of brandy at London, and by deducting from such logarithm that of the price at which the brandy may stand in, there will be a difference which will correspond in the table with a number denoting the profit per cent; observing that the research be commenced from and after the logarithm 200000, which answers to the natural number 100.

It is evident that if, instead of an invoice, not any other data were received from Cognac than a quotation of the course of exchange, and of the price of brandy, and that such price had varied but little, it would be sufficiently correct to insert in the new calculation the same logarithm of the numbers representing the charges on board; but, in case the prime cost should have undergone any material alteration, it would be necessary to consider the effect of such alteration on the charges to the time of shipment either as increasing or as diminishing the amount, and thence to determine the approximate total of the charges in question.

The analysis of the proposition abovementioned is equally applicable to any other of a different nature, and will serve to shew, in general, the utility and convenience of determining a fixed logarithm for each operation; by which means it will be easy, upon the receipt of real or of simulate invoices, or even of mere quotations of exchange and of merchandize, to discover in a few minutes either the price at which any sort of merchandize may stand in, or the eventual profit per cent by their sale.

It often happens in business, that, when certain articles of mer-



chandize sell advantageously at the place of importation, the merchants residing there send simulate accounts of sale of such articles to their correspondents abroad, with a view to enable them to discover, by a comparison of the measure of the proceeds with the prices at the place of exportation, whether it might not be advantageous to consign, upon speculation, a certain quantity of the articles under consideration. It is not, however, always easy to effect such calculations; and for this reason I shall consider how they may be simplified.

## AMSTERDAM.

*Pro forma Sales of 33 Hogsheads Jamaica Sugar.*

|                                           |             |
|-------------------------------------------|-------------|
| 47978 lbs gross                           |             |
| 330 draft, 10 lbs per hhd                 |             |
| <hr/>                                     |             |
| 47648                                     |             |
| 9529 tare, 20 per cent                    |             |
| <hr/>                                     |             |
| 38119 lbs net, at 16½ grotes per lb. .... | F. 15903 5  |
| Deduction, 2 per cent .....               | 318 1       |
|                                           | <hr/>       |
|                                           | F. 15585 4  |
| Commission, 2 per cent .....              | 311 14      |
|                                           | <hr/>       |
|                                           | F. 15273 10 |
| Duties, &c. ....                          | F. 334 16   |
| Landing charges .....                     | 26 0        |
| Weighing, &c. ....                        | 126 10      |
| Warehouse rent .....                      | 29 14       |
| Brokerage .....                           | 28 10       |
|                                           | <hr/>       |
|                                           | 545 10      |
|                                           | <hr/>       |
|                                           | F. 14728 0  |

Upon examination of this simulate account of sale, I perceive that the gross proceeds of the sale, being 15903½ florins, are reduced by the charges to 14728 florins; whence I conclude that the proceeds of a pound of sugar will be virtually reduced in the same manner at the time of actual sale. In calculating, therefore, the following proportion,

$$15903\frac{1}{2} \text{ florins} : 14728 \text{ florins} :: 16\frac{1}{2} \text{ grotes} : x,$$

I deduce from the result, which is 15½, that the price of a pound of sugar at Amsterdam, after deduction of every charge, is equivalent to 15½ grotes Flemish current; and it is upon such price that I shall ground my calculation.



## PROPOSITION.

The price of sugar at London is 55 shillings per cwt; and, according to a simulate account of sale received from Amsterdam, the selling price of the same commodity is at that place  $16\frac{3}{4}$  grotes Flemish current per pound, which is virtually reduced to  $15\frac{1}{2}$  grotes by deduction of the charges at Amsterdam. A quantity of sugar being exported thither, it is required to know at what price per pound it will stand in on arrival, and what may be the profit per cent on the sale, the exchange of London upon Amsterdam being at 37, the agio on bank money at  $4\frac{3}{4}$  at Amsterdam, the freight equivalent to  $2\frac{1}{2}$  per cent, the premium of insurance to 2 per cent, and the charges at London to the time of shipment inclusively being estimated at  $1\frac{1}{4}$  per cent.

In order to determine the relative equation, the object of which is that of ascertaining the price of a pound of sugar at Amsterdam, I say,

$$1 \text{ lb of sugar} = x.$$

I then examine the account of sale, and perceiving that there is an allowance at Amsterdam of 20 per cent for tare, and that the draft of 10 lbs per hogshead is equivalent to  $\frac{11}{16}$  per cent, I conclude that 100 lbs of raw sugar produce but  $79\frac{5}{16}$  lbs net; wherefore I say,

$$\begin{array}{l} 1 \text{ lb of sugar} = x \\ 79\frac{5}{16} \text{ lbs net} = 100 \text{ lbs gross.} \end{array}$$

I have now to compare the weight used at Amsterdam with that of London; and, by referring to the table, I perceive that 112 lbs of London are equivalent to 102,82 lbs of Amsterdam; but as the fraction of  $\frac{82}{1000}$  may be rejected on account of the loss of weight which may ensue, I say,

$$\begin{array}{l} 1 \text{ lb of sugar} = x \\ 79\frac{5}{16} \text{ lbs net} = 100 \text{ lbs gross} \\ 102 \text{ lbs of Amsterdam} = 112 \text{ lbs of London.} \end{array}$$

The customary tare at London upon sugar in hogsheads being 12 lbs per 112 lbs, and the draft 1 lb per hogshead, which may be estimated in the aggregate at  $12\frac{1}{2}$  of a pound per cwt, it follows that 112 lbs gross are reduced to  $99\frac{1}{2}$  lbs net; and perceiving by the proposition that the price of sugar at London is 55 shillings per 112 lbs, and that 20 shillings sterling, at the exchange of 37, are equivalent to 37 shillings Flemish banco, I reduce the bank money into current money, by opposing 100 to  $104\frac{1}{4}$ ; and then



the shillings Flemish current into grotes Flemish current, by opposing 1 to 12; and as it is in the latter of these monies that the price of the sugar is fixed at Amsterdam, the equation becomes complete, as follows:

|                          |                                      |
|--------------------------|--------------------------------------|
|                          | 1 lb of sugar = $x$                  |
| $79\frac{5}{16}$ lbs net | = 100 lbs gross                      |
| 102 lbs of Amsterdam     | = 112 lbs of London                  |
| 112 lbs gross            | = $99\frac{1}{2}$ lbs net            |
| 112 lbs of sugar         | = 55 shillings sterling              |
| 20 shillings sterling    | = 37 shillings Flemish               |
| 100 shillings banco      | = $104\frac{3}{4}$ shillings current |
| 1 shilling Flemish       | = 12 grotes Flemish.                 |

Upon examination of the preceding equation, I perceive that the only variable numbers are those of the cost of the sugar at London, of the course of exchange, and of the agio on bank money. After adding, therefore, the logarithms of the invariable numbers in the divisor, I subtract from their sum that of the logarithms of the invariable numbers in the dividend, and the remainder is a fixed logarithm in the divisor of 417937. I now add the logarithms of the charges mentioned in the proposition.

|                  |                         |   |      |
|------------------|-------------------------|---|------|
| Freight.....     | $2\frac{1}{2}$ per cent | = | 1072 |
| Insurance.....   | 2 ditto                 | + | 860  |
| Shipping charges | $1\frac{1}{4}$ ditto    | + | 540  |
|                  |                         |   | —    |
|                  | $5\frac{3}{4}$          |   | 2472 |

and, having ascertained the amount, I proceed to the following solution:

*Solution by Logarithms.*

|                                  |                  |   |        |
|----------------------------------|------------------|---|--------|
| Price of sugar at London .....   | 55               | = | 174036 |
| London on Amsterdam .....        | 37               | + | 156820 |
| Agio on bank money.....          | $104\frac{3}{4}$ | + | 202015 |
|                                  |                  |   | —      |
|                                  |                  |   | 532871 |
| Fixed logarithm .....            |                  | — | 417937 |
|                                  |                  |   | —      |
|                                  |                  |   | 114934 |
| Aggregate charges .....          |                  | + | 2472   |
|                                  |                  |   | —      |
| Cost at Amsterdam .....          | $14\frac{4}{5}$  | = | 117406 |
| Per centage of profit .....      | $3\frac{3}{16}$  | + | 1627   |
|                                  |                  |   | —      |
| Price of sugar at Amsterdam .... | $15\frac{1}{2}$  | = | 119033 |

The solution of this proposition is applicable to that of any other proposition of the same kind, or otherwise; and it will serve to evince the necessity of considering the difference between the



allowances made at the place of purchase, and similar allowances at the place of sale. It will also shew, that, upon the receipt of a simulate account of sale of any description whatever of merchandize, by first reducing the rate of sale inclusive of the charges, to the rate of sale exclusive of the charges, by means of a proportion similar to that which I have pointed out, the rate so reduced will serve as the basis of a calculation conformable to the abovementioned. Thus, after having once determined the fixed logarithm of each operation, it will be easy to ascertain, in a very few minutes, from the quotations of exchange and of merchandize which may be afterwards received, either the price at which the merchandize under consideration may stand in, or the profit per cent which the sale may afford.

It will be observed, by the three operations which I have just described, that, in respect to the arrangement of the charges, I have not followed the same method as that which I had previously pointed out, and which, indeed, I had till then employed, being that of adding the charges, in order to insert the sum in the equation, or to add it to, or deduct it from, the result.

In fact it has been seen, by the invoice of the wheat from Dantzic, that the charges at Hamburg have affected not only the amount of the purchase, in the first instance, at Dantzic, but also the charges there incurred. It will have also occurred to the reader, upon examination of the account of sale at London, that the factorage and commission are calculated upon the aggregate of the sale, or the gross proceeds, which comprise the first cost, the total of the charges, and also the profit arising from the speculation. Hence, after having successively determined the amount of the charges at each of the three places, I have found it necessary, in order to obtain the same result, to place the charges successively in the dividend of the equation; and it is observable, that, if I had added them, and taken the logarithm corresponding to their sum, such logarithm would have been less than the aggregate of the partial logarithms.

Again: it has been seen that, before I proceeded to the solution of the operation relative to the brandy, I employed separately the logarithms of the freight, of the insurance, and of the brokerage, the sum of which was 4505; whereas, if I had assumed the logarithm of the number 104, representing the aggregate of those charges, I should have found it to be only 4385. The difference,



therefore, between the sum of the logarithms of the separate charges and the logarithm of the aggregate of those charges is 120, which is equivalent, by the table, to rather more than  $\frac{1}{4}$  per cent.

In the description, too, of the third operation, a similar difference may be remarked of 44, between the logarithm of  $5\frac{1}{4}$ , or the aggregate of the charges, and the sum of the respective logarithms. Hence it is obvious that the method generally practised of adding the charges is not rigorously exact.

Arbitrations of exchange, and operations of bullion and specie, which offer but limited, though, in general, certain profit, occasion charges of little comparative consequence; whence it is that the correctness of the definitive results is affected in a degree far too trivial to have led me to introduce any innovation in respect to that method which has hitherto obtained in business, and from which it would be difficult to swerve, without calculating by logarithms.

This observation is essential, and serves to demonstrate the superiority of calculation by logarithms; for, if it were intended to arrive at the same degree of exactness, in the solution of the operation regarding the brandy, by the ordinary means of arithmetic, it would be necessary to bring into account the charges to be added, by inserting the following terms in the equation:

|                          |                    |
|--------------------------|--------------------|
| 100 with freight .....   | = 106              |
| 100 with insurance ..... | = 104              |
| 100 with brokerage ..... | = $100\frac{1}{8}$ |

But, in order to avoid calculations which may be said to be almost endless, the general method is that of adding the charges, and of stating,

100 with charges,  $110\frac{1}{8}$ ;

notwithstanding that the results obtained upon that principle be not so correct as they might be otherwise.

Whenever, therefore, logarithms be used in the calculation of merchandize, it will be proper, instead of assuming the logarithm of the sum of the charges, to take the partial logarithms of the numbers representing each of the same charges, and, by this method, there will not be any danger that the results be erroneous, the charges upon merchandize being always very considerable, and often more so than the amount of the first cost.



I shall now describe an operation calculated upon the receipt of a mere quotation of the price of an article of merchandize.

## PROPOSITION.

While the price of coffee at London is 146 shillings per cwt, a quotation of the same article is received from Hamburg of 18½ shillings banco per pound. The exchange of London upon Hamburg is at 35, the freight and primage equivalent to 4½ per cent, and insurance may be effected from London to Hamburg at 1½ guinea per cent. It is required to know at what rate a pound of coffee will stand in at Hamburg, and what will be the profit per cent resulting from the speculation.

In order to resolve this proposition, it is necessary, in the first place, to determine the relative equation; for which purpose I say,

$$1 \text{ lb of coffee} = x.$$

To find the relation of the weight of Hamburg to that of London, I refer to the table, which shews that 112 lbs of London are equivalent to 104½ lbs of Hamburg; but as I may estimate the loss of weight to the time of sale at ⅔ per cent, I say,

$$1 \text{ lb of coffee} = x$$

$$104 \text{ lbs of Hamburg} = 112 \text{ lbs of London.}$$

I now observe, by the proposition, that the price of coffee at London is 146 shillings; that the exchange of London upon Hamburg is at 35 shillings Flemish banco per pound sterling; and that it is necessary to reduce the shillings Flemish banco into shillings banco, since it is by the latter of these monies that coffee is sold at Hamburg; wherefore I say,

$$1 \text{ lb of coffee} = x$$

$$104 \text{ lbs of Hamburg} = 112 \text{ lbs of London}$$

$$112 \text{ lbs of coffee} = 146 \text{ shillings sterling}$$

$$20 \text{ shillings sterling} = 35 \text{ shillings Flemish}$$

$$1 \text{ shilling Flemish} = 6 \text{ shillings banco.}$$

The equation being thus determined, I efface the number 112 in each column, and, perceiving that the only variable numbers are the price of the coffee at London, and the rate of exchange, I begin by seeking the fixed logarithm to be employed in the solution of this operation, and in that of any other of the same kind, and I find that such logarithm is 253991, and is in the divisor.

I have now to consider the aggregate of the charges.



*Charges per Cent at London.*

|                       |                |   |      |
|-----------------------|----------------|---|------|
| Brokerage.....        | $\frac{1}{2}$  | = | 217  |
| Shipping charges..... | $1\frac{3}{8}$ | + | 593  |
| Insurance.....        | 2              | + | 860  |
|                       | $3\frac{7}{8}$ |   | 1670 |

The insurance is here advanced to 2 per cent, instead of  $1\frac{1}{2}$  guinea, for the reason mentioned in one of the preceding operations.

*Charges per Cent at Hamburg.*

|                                         |                 |   |      |
|-----------------------------------------|-----------------|---|------|
| Freight and primage .....               | $4\frac{1}{2}$  | = | 1912 |
| Landing charges and warehouse rent .... | 1               | + | 432  |
| Brokerage .....                         | $\frac{5}{8}$   | + | 271  |
| Commission and guarantee .....          | $3\frac{7}{8}$  | + | 1651 |
| Interest of funds .....                 | $1\frac{1}{2}$  | + | 647  |
|                                         | $11\frac{1}{2}$ |   | 4913 |

The brokerage is passed at  $\frac{5}{8}$  instead of  $\frac{1}{2}$ , and the commission and guarantee at  $3\frac{7}{8}$  instead of 3, since they will ultimately be computed upon the amount of the sale; while, in the present calculation, they only bear upon the first cost as inserted in the equation. The interest of the funds employed in the speculation is estimated at  $1\frac{1}{2}$  per cent, in the supposition that London will draw upon Hamburg for  $\frac{2}{3}$  of the amount, and that the coffee may not be sold immediately after its arrival.

*Solution by Logarithms.*

|                                  |                  |   |        |
|----------------------------------|------------------|---|--------|
| Price of coffee at London .....  | 146              | = | 216435 |
| London on Hamburg .....          | 35               | + | 154407 |
|                                  |                  |   | 370842 |
| Fixed logarithm .....            | —                |   | 253991 |
|                                  |                  |   | 116851 |
| Charges at London.....           | = 1670           | } | + 6583 |
| at Hamburg .....                 | + 4913           |   |        |
|                                  |                  |   | 123434 |
| Cost at Hamburg .....            | $17\frac{3}{20}$ | = | 123434 |
| Per centage of profit.....       | $7\frac{17}{20}$ | + | 3283   |
|                                  |                  |   | 126717 |
| Price of coffee at Hamburg ..... | $18\frac{1}{2}$  | = | 126717 |

It will be observed, that the charges at London being  $3\frac{7}{8}$  in the aggregate, and at Hamburg  $11\frac{1}{2}$ , their sum would be  $15\frac{3}{8}$ , while the sum of the partial logarithms of the same charges, which is



6583, corresponds with the arithmetical number  $16\frac{3}{8}$ , whence it is obvious that the difference is 1 per cent. In case, therefore, the trouble be not taken of extracting the partial logarithms of the charges, which, however, may be done very readily, it will be necessary that the result obtained otherwise be considered as involving the difference referred to.

It is evident that results, such as that of the operation above-mentioned, cannot be rigorously exact; they approach, however, sufficiently near to truth to be used with confidence, since there is not any surer method on which speculations, unprovided with invoices or with accounts of sale, may be grounded.

#### OF ORDERS IN MERCHANDIZE.

It sometimes happens that merchants transmit to their correspondents what may be called *orders in merchandize*, by which they are authorised to purchase certain descriptions of goods, provided that the cost be within those limits which are then determined by the merchants themselves, inclusive of all charges. The following is an abstract from a real order given in the year 1806, and the analysis of which will be of guidance in the calculation of any similar orders.

#### ORDERS IN MERCHANDIZE.

While the price of wheat at London is 100 shillings per quarter, and the exchange of London upon Lisbon at 61 pence per milreis, a merchant at London receives an order from a correspondent at Lisbon to send thither 2000 alquiers of wheat, provided that the price of each may not exceed 900 reis, inclusive of all charges, to the port of Lisbon.

In order to ascertain the possibility of the execution of the order in question, it is essential to know the relation between the alquier and the quarter, the rate of affreightment for Lisbon, the premium of insurance, and the amount of the other charges to the time of shipment inclusively.

In order to find the relation between the measures, I refer to the table of comparison of measures of corn, which shews that the quarter corresponds with 21 alquiers and a small fraction, which I shall reject, on account of the difference which may ensue from the respective modes of measuring, or from any incidental loss; and being apprised that I may freight a vessel for Lisbon at the



rate of 6 shillings per quarter, which will of course affect the prime cost of 100 shillings per quarter in the ratio of 6 per cent, and also that the terms of insurance are 3 guineas per cent, which are equivalent, as I have elsewhere observed, to 4 per cent, I shall estimate the charges of commission, factorage, &c., at 4 per cent. I have thus the necessary data to resolve the question of the possibility of the execution of the order, which may be effected either by seeking the price which I should be allowed to give for a quarter at London, according to the specific limit of 900 reis per alquier, and the exchange of 61, at which I may draw upon Lisbon; or by seeking the price at which an alquier will stand in at Lisbon, supposing that the purchase be made at London at 100 shillings per quarter. The following equations will exemplify each method:

*First Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ quarter} = x \\
 1 \text{ quarter} & = & 21 \text{ alquiers} \\
 1 \text{ alquier} & = & 900 \text{ reis} \\
 1000 \text{ reis} & = & 61 \text{ pence} \\
 12 \text{ pence} & = & 1 \text{ shilling.}
 \end{array}$$

*Second Equation.*

$$\begin{array}{rcl}
 & & 1 \text{ alquier} = x \\
 21 \text{ alquiers} & = & 1 \text{ quarter} \\
 1 \text{ quarter} & = & 100 \text{ shillings} \\
 1 \text{ shilling} & = & 12 \text{ pence} \\
 61 \text{ pence} & = & 1000 \text{ reis.}
 \end{array}$$

In the former of these equations the only numbers subject to variation are those of the price, in reis, of an alquier, and the rate of the exchange; and the similar numbers in the second equation are the price, in shillings, of a quarter, and the same rate of exchange.

The other numbers, being invariable, give a fixed logarithm of 275696, which, in the first equation, is in the divisor, and, in the second, in the dividend.

Previously to proceeding to the respective solutions, I recapitulate the logarithms of the several charges, namely,

|                    |            |   |             |
|--------------------|------------|---|-------------|
| Freight .....      | 6 per cent | = | 2531        |
| Insurance .....    | 4 ditto    | + | 1703        |
| Shipping charges.. | 4 ditto    | + | 1703        |
|                    |            |   | <u>5937</u> |

*Solution of the First Equation.*

|                         |               |   |               |
|-------------------------|---------------|---|---------------|
| Price at Lisbon .....   | 900 reis....  | = | 295424        |
| London on Lisbon .....  | 61 pence..    | + | 178533        |
|                         |               |   | <u>473957</u> |
| Fixed logarithm .....   |               | — | 275696        |
|                         |               |   | <u>198261</u> |
| Aggregate charges ..... |               | — | 5937          |
| Price of 1 quarter..... | 83½ shillings | = | 192324        |



*Solution of the Second Equation.*

|                         |                 |        |
|-------------------------|-----------------|--------|
| Fixed logarithm.....    | =               | 275696 |
| Price at London .....   | 100 shillings + | 200000 |
|                         |                 | <hr/>  |
|                         |                 | 475696 |
| London on Lisbon.....   | 61 pence —      | 178533 |
|                         |                 | <hr/>  |
|                         |                 | 297163 |
| Aggregate charges ..... | + 5937          |        |
|                         |                 | <hr/>  |
| Price of 1 alquier..... | 1074 reis .. =  | 303100 |

In the first solution the charges are deducted from the result; for, as the price of 900 reis, which an alquier is not to exceed, is inclusive of the charges, it follows that a quarter of wheat should be purchased at London at a rate so much the cheaper as the charges may be higher. I conclude, therefore, that the order cannot be executed, since the limits require that a quarter be purchased at London at  $83\frac{1}{4}$  shillings, while the actual price is not less than 100 shillings.

In the second solution I have added the charges to the result, since the price in reis at which an alquier will stand in at Lisbon will be greater in proportion as the charges may be more considerable. I conclude, therefore, in this instance also, that the order cannot be executed; since, by purchasing wheat at London at 100 shillings, and drawing upon Lisbon at 61, an alquier would stand in at Lisbon at 1074 reis, which would exceed the limits prescribed by 174 reis.

## OF ARBITRATIONS OF MERCHANDIZE.

As it is often useful in commerce to determine by calculation the place which may afford the greatest profit by the sale of merchandize intended to be exported, I shall conclude this part of my work by an arbitration of merchandize.

The name of *arbitration* has been given to researches of the nature referred to, by reason, that, as the relative calculations denote the expected profit per cent at each place, the calculator becomes his own *arbiter*; that is, it rests with him to direct the speculation to that place which, in all probability, will afford a maximum of profit.

In order to calculate arbitrations of merchandize, it is evidently necessary to know the several particulars which I have mentioned



at the beginning of the subject under consideration; and the following proposition, being purposely analysed, will be of guidance in any similar calculations.

## PROPOSITION.

A merchant at Bilboa, having a quantity of Spanish wool to be exported, of the description called *Segovianas*, which have cost him 325 reals of vellon per arroba, receives advice from London that such wool may be there disposed of at 6 shillings per pound, allowing 6 months credit; and from Amsterdam he is informed, that the price of the same article is 82 stivers banco per pound, allowing 21 months credit, and a deduction of 1 per cent for prompt payment. It is required to know the profit per cent respectively which a sale at each place would afford; the exchange of Bilboa upon London being at 37 pence sterling per dollar of exchange, and that of the same place upon Amsterdam at 87 grotes Flemish banco per ducat of exchange.

In order to resolve this proposition, it is necessary, in the first place, to consider the difference between the terms of payment, and to deduct from the amount of the selling price of the wool at each place a discount equivalent to the same terms, whence the respective rate of sale will be virtually reduced to a rate for ready money.

Thus we may suppose that the merchant at Bilboa will observe that the 6 months credit on the sale, mentioned in the quotation from London, are equivalent to a deduction of  $2\frac{1}{2}$  per cent, or of half the discount of 5 per cent per annum, and that he will, therefore, state the following proportion:

$$100 : 97\frac{1}{2} :: 6 \text{ shillings} : x;$$

the result of which, or  $5\frac{17}{20}$ , will denote to him that the price of a pound of wool, sold at London at 6 months credit, is virtually reduced from 6 shillings to  $5\frac{17}{20}$  shillings, in respect to a sale for ready money.

Observing, in like manner, that the price at Amsterdam of 82 stivers banco per pound is subject to 21 months credit, which are equivalent to a deduction of 14 per cent, according to the usual discount or rebate on merchandize of 8 per cent per annum, the merchant at Bilboa will naturally add the 14 per cent to the allowance of 1 per cent for prompt payment, and state the following proportion:

$$100 : 85 :: 82 \text{ stivers} : x;$$

X 2



the result of which, being  $69\frac{7}{10}$ , will denote to the calculator, that the price of a pound of wool at Amsterdam, in respect to a sale for ready money, is  $69\frac{7}{10}$  stivers banco.

Having thus determined the intrinsic prices upon which the respective calculations are to be grounded, our merchant will now proceed to examine the two operations resulting from the arbitration itself.

*Operation by London.*

As the rate per cent of profit cannot be ascertained but by an equation directed to the discovery of the price at which the wool may stand in at London, for the purpose of comparing the same price with that of the quotation received, it follows that

$$1 \text{ lb of wool} = x.$$

The customary draft at London being 2 lbs per bag, and the tare 20 lbs per bag, weighing in general about 200 lbs, it is inferred that the draft and tare are equivalent to a deduction from the gross weight of 11 per cent; wherefore

$$\begin{array}{rcl} & 1 \text{ lb of wool} = x \\ 89 \text{ lbs net} & = & 100 \text{ lbs gross.} \end{array}$$

Presuming that the merchant at Bilboa will have the same information as that which the reader may obtain by referring to the table of the comparison of weights, and to the description of weights under the head of Spain, namely, that 112 lbs of London are equivalent to  $103\frac{7}{10}$  lbs of Bilboa; and that the arroba, or weight by which the wool is purchased, is equivalent to 25 lbs; he will have to combine such particulars with the whole cost of 325 reals of vellon per arroba, wool being sold at Bilboa without any allowance for tare, or any rebate. The statement, therefore, will be,

$$\begin{array}{rcl} & 1 \text{ lb of wool} = x \\ 89 \text{ lbs net} & = & 100 \text{ lbs gross} \\ 112 \text{ lbs of London} & = & 103\frac{7}{10} \text{ lbs of Bilboa} \\ 100 \text{ lbs of Bilboa} & = & 4 \text{ arrobas} \\ 1 \text{ arroba of wool} & = & 325 \text{ reals of vellon.} \end{array}$$

At this stage of the calculation, the merchant at Bilboa will perceive that the exchange of Bilboa upon London is at 37 pence sterling per dollar of exchange; wherefore he will prepare the reduction of the reals of vellon into dollars of exchange, by opposing 256 to 17. He will then oppose 1 dollar of exchange to 37 pence sterling; and, as the price of wool at London is expressed by a



certain number of shillings, he will, in like manner, prepare the reduction of the pence into shillings, and determine the following equation :

|                      |                                           |
|----------------------|-------------------------------------------|
|                      | $1 \text{ lb of wool} = x$                |
| 89 lbs net           | $= 100 \text{ lbs gross}$                 |
| 112 lbs of London    | $= 103\frac{7}{10} \text{ lbs of Bilboa}$ |
| 100 lbs of Bilboa    | $= 4 \text{ arrobas}$                     |
| 1 arroba of wool     | $= 325 \text{ reals of vellon}$           |
| 256 reals of vellon  | $= 17 \text{ dollars of exchange}$        |
| 1 dollar of exchange | $= 37 \text{ pence sterling}$             |
| 12 pence sterling    | $= 1 \text{ shilling sterling.}$          |

Upon examination of the equation as it will then stand, the merchant will see that the cost of the wool at Bilboa, and the course of exchange, are the only variable numbers; and he will accordingly determine the fixed logarithm, which will be found to be 363774, in the divisor.

#### *Operation by Amsterdam.*

In order to determine an equation which will denote the price at which a pound of wool will stand in at Amsterdam, it will be necessary to begin by saying,

$$1 \text{ lb of wool} = x:$$

considering now that an allowance is constantly made at Amsterdam of 4 lbs per bale, as also of 14 lbs per bale for tare, the calculator will estimate the whole at 9 per cent, the gross weight of each bag being about 200 lbs.

But, as there is a further allowance at Amsterdam of 24 lbs in every 175 lbs, which is equivalent to  $13\frac{5}{7}$  lbs per cent, the calculator will add 9 to  $13\frac{5}{7}$ , and say,

$$77\frac{2}{7} \text{ lbs net} = 100 \text{ lbs gross.} \quad 1 \text{ lb of wool} = x$$

He will then, in order to reduce the weight of Amsterdam into that of Bilboa, oppose 100 lbs of Bilboa, or 4 arrobas, to  $99\frac{1}{6}$  lbs of Amsterdam; and, as each arroba costs 325 reals of vellon, he will say,

$$\begin{array}{rcl} & 1 \text{ lb of wool} & = x \\ 77\frac{2}{7} \text{ lbs net} & = & 100 \text{ lbs gross} \\ 99\frac{1}{6} \text{ lbs of Amsterdam} & = & 4 \text{ arrobas of Bilboa} \\ 1 \text{ arroba of wool} & = & 325 \text{ reals of vellon.} \end{array}$$

The exchange of Bilboa upon Amsterdam being at 87 grotes Flemish banco per ducat of exchange, it is necessary to reduce the reals of vellon into ducats of exchange; and, as 6000 reals of



vellon are equal to 289 ducats of exchange, he opposes these numbers to each other: he will then oppose 1 ducat of exchange to 87 grotes Flemish banco; and, after reducing the grotes into stivers banco, being the description of money in which the price of wool is fixed at Amsterdam, he will have the materials for the following equation:

|                                  |                          |
|----------------------------------|--------------------------|
|                                  | 1 lb of wool = $x$       |
| $77\frac{2}{7}$ lbs net          | = 100 lbs gross          |
| $99\frac{1}{6}$ lbs of Amsterdam | = 4 arrobas of Bilboa    |
| 1 arroba of wool                 | = 325 reals of vellon    |
| 6000 reals of vellon             | = 289 ducats of exchange |
| 1 ducat of exchange              | = 87 grotes Flemish      |
| 2 grotes Flemish                 | = 1 stiver banco.        |

Proceeding to examine this equation, he will perceive that the only variable numbers are the price of the wool at Bilboa, and the course of the exchange, whence he will determine the fixed logarithm, which is 290069, in the divisor.

*Solution of the First Equation.*

|                               |                      |        |
|-------------------------------|----------------------|--------|
| Price of wool at Bilboa ..... | 325 =                | 251188 |
| Bilboa on London .....        | 37 +                 | 156820 |
|                               |                      | <hr/>  |
|                               |                      | 408008 |
| Fixed logarithm .....         | —                    | 363774 |
|                               |                      | <hr/>  |
| Cost at London .....          | $2\frac{37}{18}$ =   | 44234  |
| Per centage of profit .....   | $105\frac{37}{12}$ + | 31353  |
|                               |                      | <hr/>  |
| Price of wool at London ..... | $5\frac{7}{10}$ =    | 75587  |

*Solution of the Second Equation.*

|                                  |                    |        |
|----------------------------------|--------------------|--------|
| Price of wool at Bilboa .....    | 325 =              | 251188 |
| Bilboa on Amsterdam .....        | 87 +               | 193952 |
|                                  |                    | <hr/>  |
|                                  |                    | 445140 |
| Fixed logarithm .....            | —                  | 290069 |
|                                  |                    | <hr/>  |
| Cost at Amsterdam .....          | $35\frac{13}{4}$ = | 155071 |
| Per centage of profit .....      | $96\frac{1}{8}$ +  | 29252  |
|                                  |                    | <hr/>  |
| Price of wool at Amsterdam ..... | $69\frac{7}{10}$ = | 184323 |

From the solution of the equations abovementioned, it is to be inferred that, by the operation by London, the profit would be  $105\frac{37}{12}$  per cent, minus the charges; while the profit per cent, by



the operation by Amsterdam, would be  $96\frac{1}{8}$ , minus the charges. Hence, as the merchant at Bilboa will consider that the commission, the brokerage, and other charges incidental to the sale, may be deemed to be nearly of the same magnitude, whether incurred at London or at Amsterdam, he will be determined, in the choice of one of those places, by the joint consideration of the respective per centage of profit, of the rates of freight, and of the premiums of insurance; observing, however, that there is a slight difference in favour of Amsterdam in respect to the duties, which, in that city, are not more than 15 stivers banco per bale; while the duties at London are at present at the rate of a halfpenny per pound, and  $27\frac{1}{2}$  per cent on the amount of that duty.

To conclude: the explanation of this proposition is obviously applicable to any other involving the discovery of the profits to be derived from the sale of any description of goods at any given place; and, by instituting as many operations as there may be places under consideration, the most effective means will be taken of guiding choice by calculation.



DESCRIPTION  
OF  
**Monies, Weights, and Measures.**

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IN that state of society in which distinction of property was first established, the advantage must have been soon felt of referring to a common measure of the value of each of the consumable necessities of life, as articles of which an individual might prescriptively appropriate to himself the exclusive use. Different metals were at first substituted to the several productions of the animal and vegetable kingdoms, as the signs of such common measure ; and as it was obviously expedient to determine the quantity of metal given or received in exchange, specific weights were invented.

Thus the Egyptians, several nations of the East, the Greeks, and the Romans, appreciated the metals which they respectively used merely as weights ; and the Greeks, in particular, never gave any other denominations to the coins which they employed than those expressive of their respective weights. It was only in modern times, after the introduction of the practice of determining the quality as well as the quantity of the several portions of metals by affixing a particular stamp to each, and by making each of a certain shape, that it was agreed to consider such portions as possessing a value abstracted from that inherent in their weight and fineness.

The first coins which were circulated, not by weight but by tale, were of the coarser metals, such as copper and iron. The common basis of the coins of the Greeks, properly so called, was a weight named *obolus*, 6 of which composed the drachma.

The Romans had recourse, at first, to a copper coin of irregular shape, without any stamp, and which was received only by weight. About the year of Rome 176, they adopted a more perfect coinage of the same metal, the basis of which was the *as*, or one pound weight ; and the pieces of such coinage were stamped with the figures of those animals, such as oxen or sheep, of which they represented the value.



It was not till the year 485 that any coin was struck of silver : it received the name of *denarius*, and contained an ounce of pure metal.

Not any gold coins appeared till the year 547, when a pound of pure gold was coined into 96 pieces, which received indifferently the denominations of *aureus*, *solidus*, *sols*, or merely that of *denarius*.

Without adverting to the alterations in respect to the several coinages of the antients, I shall proceed to consider the new system introduced by Charlemagne, and the basis of which was the pound "*de marc*," troy weight.

The pound in question, which was composed of 12 ounces of pure silver, constituted at that time the money-pound, or that in which accounts were kept in France. Both pounds were divided in the same way ; the latter by the mode of computing, and the former by the mode of coinage, that is, into 20 parts called *sols*, each of which was subdivided into 12 *deniers* ; and as the same denominations were used in respect to the component parts of the pound weight and to those of the money-pound, it is obvious that the analogy was perfect.

The pound, as it is thus described, was introduced towards the close of the eighth century into the greater number of the states of Europe. It has since been every where reduced in its primitive value, according to the policy or to the wants of the rulers of the respective states ; but a pound is still extant in the same states, having the same divisions into 20 parts, and subdivisions into 12 parts, though the value of each be different, and though each be destitute of any other relation to the other than that of a common origin. The same pounds are also in general the basis of the monies of account.

It was at first my intention to have treated of the systems of coinage of the principal European nations ; to have described the practical alterations introduced in this respect by their respective rulers ; the weights to which the coins were referred ; the standard of the same coins ; the allowances made to the officers of the mints for the remedy of the mint ; the numeral value at which the coins were severally received in circulation ; and, lastly, the proportion gradually established between gold and silver, in consequence of the coinage of the former of these metals by comparison with the coinage of silver. This laborious undertaking



was begun, and, if executed, might have interested a certain description of my readers. Reflecting, however, that "The ELEMENTS of COMMERCE" are directed, both in their origin and in their tendency, to public utility, rather than to any object of curiosity, and that I have hitherto confined myself to treating of that which is extant, with exclusion of what is now obsolete, I have abandoned a purpose which would have been the means of adding more to the bulk than to the real commercial importance of the publication.

I shall proceed, therefore, to explain that which is meant, in respect to coinage, by the words *remedy of the mint*; when I shall offer a few observations upon the practice of considering certain monies as imaginary; and conclude by developing the plan of this part of my work, and by citing the authorities upon which I have grounded the description and relation of the monies, weights, and measures, which are therein referred to.

It was enacted by the French government on the 1st January, 1726, that  $8\frac{3}{10}$  crowns should be coined from the marc of 8 Paris ounces, and be each of the reputed standard of 11 deniers: the allowances were fixed at 36 grains per marc for the remedy of the mint in respect to weight, and to 3 grains of fine silver for a similar remedy in respect to fineness. The numeral value of the same crown was at first 5 livres tournois; but, by an edict of the 26th of May following, it was extended to 6 livres.

According to the edict referred to, a marc containing 11 parts of fine silver and 1 of alloy, and weighing 4608 grains of France, was to be coined into  $\frac{3}{10}$  crowns of 6 livres. Upon this footing the weight of a crown ought to have been  $555\frac{1}{8}$  grains  $\frac{1}{8}$  fine. As, however, the difficulty was anticipated of coining pieces with rigorous exactness in respect to a specific weight, an allowance of 36 grains per marc was fixed, at the same time, under the denomination of the remedy of the weight, which, if carried to its utmost extent, would have reduced the marc of silver to 4572 effective grains, and the crown to  $550\frac{1}{8}$  grains; whence it follows that the maximum of the weight of the crown was  $555\frac{1}{8}$  grains, and the minimum  $550\frac{1}{8}$  grains. Thus, every crown issued into circulation by the different farmers of the mint, not weighing less than the minimum, was reputed to be of the weight fixed by the law as a maximum.

In like manner, as it is difficult to coin pieces of metal of an



absolute degree of specific fineness, the government fixed another allowance of 3 grains of fine silver, under the denomination of the remedy of the alloy ; so that every piece being of a standard of not less than 10 deniers 21 grains, was reputed to be of the full standard of 11 deniers.

It will be easily conceived, that the farmers of the mint, with a view to profit as much as possible by their undertaking, would reduce the weight and the standard of the crowns to the nearest degree of approximation at which the coins might be struck, without the risk of deficiency either in weight or in standard.

Thus it is that the general coinage of the pieces in question was admitted upon the footing of  $8\frac{3}{10}$  crowns from the mass of a marc reduced to 4578 grains of the standard of 10 deniers  $21\frac{1}{2}$  grains of fine silver, or a little more or less ; that is, that the farmers of the mint availed themselves of an effective toleration of 30 grains in 36, as a remedy of weight ; and of a similar toleration of  $2\frac{1}{2}$  grains of fine silver in 3 grains, as a remedy of alloy. Hence the French crown of 6 livres would be equivalent with  $551\frac{47}{83}$  effective grains of France, corresponding with  $452\frac{1}{2}$  grains troy weight of England ; and its standard, according to English computation, would be, as I have already pointed out, 10 ounces 18 pennyweights.

Such having been the principle not only of the coinage of the crowns in France, but also of the louis d'or, and of a great number of the coins of other countries, it will be readily conceived that not any particular assays, either in respect to weight or to standard, of any piece whatever, being subject to the variations referred to, can possibly possess that degree of exactness which results from the examination of the coinage of a country in the aggregate ; and that the pars of exchange which I have determined under the preceding head, and which embrace the consideration of the remedies of weight and of alloy, could not be brought to a greater degree of precision, and would not, probably, afford results equally correct, if the weight and the standard of the effective pieces, which are the basis of the research, were deemed correct as the special consequence of any particular assay.

Independently of the monies of account, and of the several denominations of specie, there are, in certain states, monies of exchange, to which, as well as to the monies of account, the qualifying epithet has been applied of *imaginary monies*. This ap-



pellation, however, does not convey an adequate notion of what is commonly understood by the several denominations of monies of account, and of monies of exchange. The subject may be explained as follows: the pound sterling of England, the livre tournois of France, the florin of Holland, the pound banco of Prussia, the lira fuori di banco of Genoa, the livres current in other states; in a word, all the monies of account in use in Europe, if they be not of the identical value of some one of effective coins of gold or of silver which are respectively in circulation in the same states, do, in fact, represent determinate fractions, and, in many cases, aliquot parts of such denomination of specie, at the same time that they also represent exact multiples of some other money of the same country, either of silver or of copper. Each of the parts composing the monies of account are, therefore, of the identical value of the corresponding parts which compose the real monies. Thus, the reality of the pound sterling exists in the  $\frac{20}{1}$  of a guinea, or in the reunion of 4 crowns, or of 20 shillings. The reality of the livre tournois exists as an aliquot part of the louis d'or or of the French crown, and in the reunion of 20 sols effective money.

Certain monies of exchange may be of the identical value of certain monies of account in the same country, and possess, in consequence, a determined relation of value to the real monies. But, if there be not any such identity of value, and that the monies of exchange be not precisely equivalent with any effective money, or with any money of account, they will nevertheless be found to denote certain determinable quantities of the latter. Thus, in Spain, the reality of the dollar of exchange exists in the reunion of 8 reals of plate; and, in Portugal, the milreis contains  $2\frac{1}{2}$  effective crusades of gold, called *cruzados velhos*, each of which is equivalent with the crusade of exchange of 400 reis.

Whatever be the point of view, therefore, under which we may consider the monies of account and the monies of exchange, there exists in every country where they are in use an intimate and direct relation between each of such monies and the real monies properly so called; whence it may be inferred, that the pound sterling, the livre tournois, and any other money of account or of exchange, cannot strictly be denominated imaginary monies.

The description of the monies, weights, and measures of different countries has occupied the attention of many men of learn-



ing, several of whom have thoroughly treated of these subjects. Among their respective works, however, there is not any which equals in exactness and method that under the title of the *Hamburguischer Kontorist*, by the celebrated Kruse, who, whenever he could not verify by himself that which he was describing, judiciously referred to the original works composed in the countries themselves, whose coinage, or the relative subjects, were under consideration.

The merit of the work in question was soon appreciated. The *Traité Général de Commerce*, by Samuel Ricard, to which I have referred in the "MERCHANT'S ASSISTANT," having been republished at Amsterdam, in 1781, by Marien, upon a new plan, he substituted the descriptions and the tables of the weights and measures, inserted in the *Hamburg Kontorist*, to those adopted by Ricard, and the former were afterwards copied into the *Encyclopédie Méthodique* of France. The correctness of the system of Kruse was also ascertained by Gerhardt, of Berlin, who was himself known by excellent works upon commerce. Marien afterwards introduced it into Spain, in his *Tratado General de Monedas, &c.*, printed at Madrid in 1789, as he acknowledges in his preface to that work. In a word, if we except a few errors in the original work, which were in a great measure corrected by Marien, and some alterations made by the latter in consequence of actual assays by Tillet, of the Academy of Sciences at Paris, the *Hamburg Kontorist* is become the standard work of the commercial nations upon the continent.

By introducing, therefore, into England, whose greatness and power are inherent in her commerce, a system of monies, weights, and measures, thus generally adopted, I indulge a hope that it cannot fail of being favourably received, and that it will take precedence of the tables hitherto published, and which are of as little practical use in accompting houses, as they are erroneous and incomplete in their composition.

It will be seen, however, that I have not servilely copied the work in question; for, independently of the introduction of a new system of monies, weights, and measures, into France, since the revolution in that country, recent works have appeared, containing the most circumstantial details upon the metrology of the countries in which they have been published: such, among others, are the *Dictionnaire Universel de la Géographie Commercante*, by



Peuchet, an 8 ; and *El Guia de Comerciantes*, published annually in Spain, by order of government.

To conclude : the description of the monies, weights, and measures, of the several commercial nations of the world, which is the subject of this part of my work, is founded, as well as the tables of comparison which will be found under the next head, upon the *Hamburguischer Kontorist* of Kruse, and upon *El Tratado General* of Marien. I should add, however, that, in performing my calculations with reference to those works, I have adopted the corrections made by Marien, and detected such errors of the press as had occurred ; that, after having suppressed certain articles which would be no longer useful, I have corrected or added several others from other unquestionable authorities, whom it would be tedious to enumerate ; and, lastly, that, having revised all my calculations by the help of logarithms, I have not omitted any means of presenting to the public a system of monies, weights, and measures, adapted to England, which, I trust, will be found to possess all the conciseness, method, and exactness, to be expected in a work of this kind.

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#### ENGLAND.

Accounts are kept in England in pounds sterling, each consisting of 20 shillings, and each shilling of 12 pence.

The principal coins of this kingdom are as follow :

Of gold : the guinea of 21 shillings ; the half guinea of 10 shillings and 6 pence ; the third of a guinea, or seven shilling piece. The sovereign of 20 shillings, and the half sovereign of 10 shillings, coined in 1817.

Of silver : the crown of 5 shillings ; the half crown of 2 shillings and 6 pence ; the shilling of 12 pence ; the six-penny piece.

Of copper : the penny of 4 farthings ; the halfpenny of 2 farthings ; the farthing of a quarter of a penny.

The pound, troy-weight, consists of 12 ounces, the ounce of 20 pennyweights, and the pennyweight of 24 grains ; whence the pound contains 5760 grains, and the ounce 480 grains.

The imaginary unit of reference in the assaying of gold, which may be indifferently called a pound or an ounce, is divided into



24 carats, and each carat into 4 grains, whose fractions have not any specific denomination.

The ounce of standard gold consists of 22 carats, and is worth 3 pounds 17 shillings  $10\frac{1}{2}$  pence sterling.

The imaginary unit in the assaying of silver is divided into 12 ounces, and the ounce into 20 pennyweights.

Standard silver consists of 11 ounces 2 pennyweights, and is worth 5 shillings and 2 pence sterling.

The coinage of gold and silver is regulated as follows :

A pound of standard gold, troy-weight, is coined into  $44\frac{1}{2}$  guineas ; and a pound of standard silver, also of troy-weight, is coined into  $12\frac{2}{3}$  crowns, or 62 shillings ; and the other coins in the same proportion.

The charges of coinage, which amount to  $\frac{7}{10}$  per cent upon gold, and to  $2\frac{7}{8}$  per cent upon silver, are defrayed by government ; so that those who take to the Mint bullion of the standard required, receive in exchange for an ounce of gold £3 17  $10\frac{1}{2}$ , which is paid, as nearly as the sum admits, in gold coin ; and, in exchange for an ounce of silver, 62 pence, that is, five shillings in silver coin, and two pence in copper coin : in fact, if the whole of those sums could be paid in gold and silver respectively, it would be found that each would contain an ounce of standard metal.

The proportion between gold and silver is in England as 1 to  $15\frac{5}{4}$ .

Apothecaries make use of the pound troy-weight, which they divide into 12 ounces, 96 drams, 288 scruples, or 5760 grains.

The ounce for weighing diamonds and pearls is divided into 150 carats, and each carat into 4 grains.

The pound *avoir du poids* which is used for weighing almost every description of merchandize, is divided into 16 ounces, 256 drams, 1024 quarters, and is equivalent to 7000 grains troy-weight ; wherefore

144 pounds *avoir du poids* make 175 pounds troy-weight.

The ton is 20 hundred weight, 80 quarters, and 2240 pounds avoirdupois, and the hundred weight is therefore composed of 4 quarters, or 112 pounds.

The ton or fodder of lead, used at London and at Hull, weighs  $19\frac{1}{2}$  hundred weight, but, when in sheets, it consists of 20 hun-



dred. The ton at Newcastle weighs 24 hundred, and that at Scarborough 22.

A last of wool is composed of 12 sacks, 24 weys, 156 tods, 312 stone, 624 cloves, or 4368 pounds.

A last of corn and of salt measures  $1\frac{2}{3}$  wey, 10 quarters, 20 cooms, 40 strikes, 80 bushels, 320 pecks, 640 gallons, 1280 pottles, 2560 quarts, or 5120 pints. The quarter consists of 8 bushels; and, by an act of parliament passed in 1712, each bushel should contain 2178 cubic inches.

The ton of pit coal consists at London of 12 score, or 240 canisters, and is equivalent to 2 keel, or 16 chaldron, Newcastle measure.

A stone of fish is 8 lbs; of glass 5 lbs; and a stone of hay, iron, shot, &c., and horseman's weight, 14 lbs.

A tun of wine, of brandy, and of other liquids, contains 2 pipes, 4 hogsheads, 6 tierces, 8 barrels, 14 rundlets or kilderkins, 252 gallons, 504 pottles, 1008 quarts, or 2016 pints.

A gallon measures 231 cubic inches.

All vegetable oil is sold by the tun of 236 gallons, but all animal oil by the tun of 252 gallons.

A last of ale is composed of 8 hogsheads, 12 barrels, 24 kilderkins, 48 firkins, 384 gallons, 768 pottles, 1536 quarts, or 3072 pints. The same measures compose a last of herrings and of soap.

A tun of beer contains 2 butts, 4 hogsheads, 6 barrels, 12 kilderkins, 24 firkins, 216 gallons, 432 pottles, or 1728 pints. A gallon measures 282 cubic inches; wherefore

77 beer gallons make 94 wine gallons.

Two measures are used in England for cloths, stuffs, and linens. The ell, of the length of  $1\frac{1}{4}$  yard, or 45 inches; and the yard of 3 feet, or 36 inches.

A foot is 12 inches, or 144 lines.

An acre of land is 4 square roods, 160 square poles, or 4840 square yards.

A mile is divided into 8 furlongs, 1760 yards, or 5280 feet.

A furlong is divided into 40 poles, 110 fathoms, 132 paces, 220 yards, 660 feet, 880 spans, 2640 palms, or 7920 inches.

A marine league is 3 miles, and 20 leagues or 60 miles compose a degree.



## ACHEM.

In this kingdom, situated in the island of Sumatra, accounts are kept in taels or tayels, each consisting of 4 pardos, and each pardo of 4 maces. A tayel is also divided into 64 coopangs, and is equivalent to 25600 cash.

The candil, weight for rough goods, consists of 200 cattis, and each catti is composed of 20 boncals, 100 tayels, 280 pagodas, 320 maxans, 1600 maces, or 6400 coopangs.

Gold dust of the purity of  $9\frac{1}{4}$  touch, which are equivalent with  $22\frac{1}{5}$  carats, is sold by the boncal; each being worth 7 gold tayels, money of account, 5 of which are equal to 4 tayels currency.

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 ACKRE.

In this city of Syria, accounts are kept in piastres of 80 aspers.

The cantaro is composed of 100 rotolos. A rotolo of cotton renders at Leghorn  $6\frac{1}{2}$  lbs, which are equivalent to  $4\frac{37}{40}$  lbs of England.

The ardep, or measure for rice, renders at Leghorn 750 lbs, equivalent to 568 $\frac{1}{2}$  lbs of England.

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 AIX LA CHAPELLE,

Formerly a free imperial city, and now chief city of the department of Roer, in France. Accounts are kept in *reichsthalers* or rixdollars currency, each rixdollar consisting of 54 marcs, and each marc of 6 busches currency.

An effective rixdollar is 72 marcs, and a schlecht-thaler is only 26 marcs.

The following is the relation between the several monies of this city:

1 effective rixdollar is equivalent to  $1\frac{1}{3}$  rixdollar currency, 2 reichs-guldens,  $2\frac{10}{13}$  schlecht-thalers, 8 shillings, 12 guldens, 72 marcs, 432 busches, 1728 hellers.

The coins of this city are as follow:

Of gold: the ducat of  $3\frac{1}{2}$  rixdollars currency.



Of silver: the raths-præsentger of 16 marcs; there are also double and half pieces of that name, and of proportionate value.

Of silver and copper: pieces of 3, 2, and 1 marc.

Of copper: pieces of 3 and 1 busch, or of 12 and 4 hellers.

The schipfund, commercial weight, consists of 3 centners, the centner of 100 pounds; but the schipfund which is used in respect to the carriage of goods is 318 pounds.

The pound is divided into 2 marcs, 16 ounces, 32 loths, 128 quintins, or 512 pfenings.

A malter of corn is 6 fas. A fas of wheat contains 4 kops, and that of oats 6 kops.

An ahm of wine measures 130 kanns.

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#### ALGIERS.

In this state of Barbary, accounts are kept as follow:

In saimes, or doblas, of 50 aspers.

In patacas chicas, or patacas of aspers; each pataca consisting of 8 teminas, or 232 aspers.

The coins of Algiers are as follow:

The pataca gouda or gorda, of 3 patacas chicas; the temina of 29 aspers; the caruba of 14 aspers.

The sultanin of Turkey is worth about  $8\frac{1}{2}$  patacas chicas, and the sequin of the same country 10. The Joanese, which the Algerines call *carota*, is worth about  $4\frac{1}{2}$  sultanins; and the hard dollar is sold from  $4\frac{3}{4}$  to  $4\frac{7}{8}$  patacas chicas.

The *cantaro* or quintal consists of 200 rotolos; but the cantaro for weighing figs, raisins, butter, honey, dates, oil, and soap, is composed of 166 rotolos; that for iron, lead, thread, and wool, of 150; that for almonds, cheese, and cotton, of 110; and, lastly, that for bronze, copper, wax, and drugs, of 100.

The rotolo is divided into 16 ounces.

The mitigal, for weighing diamonds, pearls, gold, and silver, is about 72 grains troy-weight.

A caffise of corn contains 16 terries.

The pik, or pico Turco, cloth measure, is divided into 8 robi; and the pik, or pico Moro, is used for measuring linen. 100 picos Moros correspond with 75 picos Turcos.



## ALEPPO.

In this as well as in other cities of Syria, accounts are kept in piastres of 80 aspers. The piastre is also divided into 24 syainos.

A Spanish dollar being worth 2 piastres, more or less, a piastre is, therefore, of the value of about 2 shillings 3 pence sterling.

The cantaro, or weight for rough goods, which is equivalent with the cantaro of Tripoli, consists of 100 rotolos, and each rotolo of 12 ounces or 720 drams.

The zurlo is composed of  $27\frac{1}{2}$  rotolos.

The rotolo, used for weighing the silks of Tripoli and Antioch, as well as those denominated Barutinas, Payases, Beduinas, and Beiledinas, is composed of 700 drams; and the rotolo for weighing the silks of Persia, and those denominated Cerbaffis, Burmas, Ardassas, and Ardassetas, is composed of 680 drams.

There are other weights in Syria: the cola, consisting of 7 vesnos; each vesno of 5 rotolos or 200 drams. The batman, consisting of 6 okas, each oka of 400 drams.

The metical, used for weighing diamonds and pearls, is  $1\frac{1}{2}$  dram.

## ALEXANDRIA.

In this city, and in all Egypt, accounts are kept in piastres, each piastre consisting of 33 medins, and each medin of 8 borbos, or 6 forlos. A medin is worth 3 aspers.

A Spanish dollar being worth 76 medins, more or less, a piastre is, therefore, of the value of about 2 shillings sterling.

The coins of Egypt are the ducatelo of 10 medins, the griscio or abunquepe of 30 medins, and the zinzerlo of 107 medins.

The monies of Turkey are also received in Egypt as currency; that is, the sequin fundukli for 126 medins, and the sequin zaramabuc for 110 medins.

The cantaro is composed of 100 rotolos; and there are several sorts of rotolos, known by the denomination of forforo, zaydino, zauro, and mina.

The oka consists of 200 drams, each dram of 16 kirates, or 64 grains.

Corn is measured either by the rebebe or the kizloz,



## ALICANTE.

Accounts are kept in libras or pesos, each libra consisting of 20 sueldos, and each sueldo of 12 dineros.

The libra consists of 10 reals of Alicante; and as it is equal to the dollar of exchange, the real of Alicante is worth  $5\frac{1}{2}$  maravedis of vellon.

The proportion between the coins of Alicante and those of Castille is as follows:

|                                 |                        |
|---------------------------------|------------------------|
| 375 libras of Alicante make     | 272 ducats of exchange |
| 75 libras of Alicante . . . . . | 68 ducats of Alicante  |
| 4 ducats of exchange . . . . .  | 5 ducats ditto         |
| 4 reals of plate . . . . .      | 5 reals ditto          |
| 128 reals of vellon . . . . .   | 85 reals ditto.        |

The carga consists of  $2\frac{1}{2}$  quintals or 10 arrobas Valencianas. The quintal is composed of 4 arrobas, and each arroba of 24 libras mayores, 36 libras menores, 30 libras of 14 ounces each, or 27 libras of 16 ounces each.

The libra mayor, for weighing fruit, is 18 ounces of Valencia.

The libra menor is 12 ounces of Valencia, and serves for weighing almost every description of merchandize.

The libra castellana of 16 ounces is used in respect to the payment of duties.

31 ounces of Valencia make 32 ounces of Castille.

The cahiz or caffise consists of 12 barchillas, each of 4 celemines, or 8 half celemines, the half celemine of 2 quartillas. 100 fanegas of Castille are equal to  $22\frac{3}{4}$  cahices of Alicante.

The cantara, measure for liquids, corresponds with 21 quartillos of Castille, more or less.

The tonelada is 2 pipas, 80 arrobas, 100 cantaros. The pipa contains 50 cantaros, which make  $44\frac{1}{2}$  arrobas menores of 25 libras of Castille.

The vara is divided into 4 palmos, and 100 varos of Alicante are equal to 101 varas of Castille.

## AMSTERDAM.

In this, and in the other cities of Holland, accounts are kept in *guldens* or florins, each consisting of 20 stivers, and each stiver of 16 pennings.



The *pond Flaams*, or pound Flemish, consists of 6 florins, 20 shillings, 120 stivers, or 240 grotes.

The *goud-gulden*, or gold florin, by which the price of corn is regulated in Holland, is worth  $1\frac{2}{5}$  florin, or 28 stivers; whence 5 gold florins are equal to 7 florins current.

There are both current money and bank money.

The current money chiefly consists of the following coins:

Of gold: the ryder or reyder of 14 florins; the half ryder of 7 florins; and the ducat of  $5\frac{1}{4}$  florins. The ducat is not, however, a coin issued by the state, and its value is subject to variations.

Of silver: the *ducaton* or ducatoon of 3 florins 3 stivers; the piece of 3 florins; the rixdaler of 2 florins 10 stivers; the daler or dalder of 30 stivers; and the florin of 20 stivers.

Of silver and copper: the shilling of 6 stivers; the sesthalve of  $5\frac{1}{2}$  stivers; the dubbeltje of 2 stivers; the stiver of 16 pennings.

Of copper: the duyten of 2 pennings.

The Bank of Amsterdam keeps its accounts in bank money, and receives the following coins in deposit at the under mentioned prices:

The ducat of Holland for 4 florins 19 stivers 8 pennings banco; the old louis d'or of France for 8 florins 14 stivers; the ducaton for 3 florins; the rixdaler for 2 florins 8 stivers; the Spanish doubloon, of the coinage previously to 1772, for 22 florins; and the new doubloon for 21 florins 10 stivers.

The Bank also receives effective florins, with an equal quantity of ryders, under the deduction of  $4\frac{1}{8}$  per cent, which difference denotes the proportion between bank money and current money.

The marc, denominated troy-weight, which is used for weighing precious metals, consists of 8 ounces, 160 engels or estelins, and 5120 as.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains.

In the assaying of silver, the marc is divided into 12 pennyweights, the pennyweight into 24 grains.

The coinage of gold and silver is regulated as follows:



A marc of gold of the purity of 22 carats and 1 grain, inclusive of  $\frac{3}{4}$  of an estelin for the remedy of the weight, and 1 grain for the remedy of the alloy, is coined into  $24\frac{8}{13}$  ryders, or  $49\frac{3}{13}$  half ryders, each ryder being worth 14 florins; but as the charges of coinage, which amount to 1 per cent, are deducted, the intrinsic value of a ryder is only 13 florins 17 stivers 6 pen-nings.

A marc of silver of the purity of 11 pennyweights and 7 grains, inclusive of 1 estelin for the remedy of the weight, and 1 grain for the remedy of the alloy, is coined into  $7\frac{8599}{16943}$ , or very nearly  $7\frac{1}{2}$  ducats. Thus, the marc is worth 23 florins 13 stivers; but as the charges of coinage, which amount to  $\frac{1}{8}$  per cent, are deducted, the intrinsic value of the marc is only 23 florins 7 stivers and 11 pen-nings.

A marc of silver of the purity of 10 pennyweights and 11 grains, inclusive of 1 estelin for the remedy of the weight, and 1 grain for the remedy of the alloy, is coined into  $8\frac{2072}{2921}$ , or very nearly  $8\frac{1}{2}$  rixdalers; and a marc of 11 pennyweights 1 grain fine, inclusive of similar remedies, is coined into  $7\frac{24149}{32892}$ , or very nearly  $7\frac{3}{4}$  pieces of 3 florins, called in Holland *staten gulden*, or state florin.

And, lastly, a marc of silver of the purity of 11 pennyweights, inclusive of 1 estelin for the remedy of the weight, and  $1\frac{1}{2}$  grain for the remedy of the alloy, is coined into  $23\frac{151}{223}$ , or very nearly  $23\frac{1}{2}$  florins, the charges of coinage being  $1\frac{1}{2}$  per cent.

The proportion between gold and silver is, in Holland, as 1 to  $14\frac{3}{4}$ .

The marc troy-weight, for weighing diamonds and pearls, consists of 160 estelins, or 1200 carats; the estelin of  $7\frac{1}{2}$  carats; and the carat is divided into  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$ ,  $\frac{1}{32}$ ,  $\frac{1}{64}$  parts.

Apothecaries make use of two sorts of weights. They divide the pound called arsenic weight into 16 ounces, the ounce into 8 drams, the dram into 8 scruples, and the scruple into 20 grains.

The pound, apothecary weight, consists of 12 ounces, or 24 looten; whence 3 pounds arsenic weight are equal to 4 pounds apothecary weight.

The pound, commercial weight, should be 2 marcs, or 10240 as, troy-weight; but it weighs 10280 as; whence 256 pounds of Amsterdam are equal to 257 pounds troy-weight at the same place.



The *schippondt* consists of 3 *centenaar* or quintals, 20 *lisponds*, or 300 pounds; the *lispond* is 15 pounds, and the *steen* or stone 8 pounds.

A last of corn is composed of 27 muddes, 36 sacks, 108 *scheepels* or *aggelen*, 432 *vierdevats*, 3456 kops.

A *tonne* or barrel of corn measures 4 *scheepels*, or 160 kops.

The last of Amsterdam is used in the other cities of Holland, but in some of them it is divided as follows:

At *Hoorn*, *Eenhuysen*, *Muyden*, *Narden*, and *Weesp*, into 22 muddes, 44 sacks, 88 *scheepels*, or 352 *taakels*.

At *Haarlem*, into 38 sacks.

At *Rotterdam*, *Delft*, and *Schiedam*, into  $2\frac{3}{4}$  *hoedts*; the *hoedt* into  $10\frac{2}{3}$  sacks, or 32 *achtendeelen*.

At *Alckmaar*, into 32 sacks.

At *Gouda*, into  $2\frac{2}{3}$  *hoedts*; the *hoedt* into  $10\frac{2}{3}$  sacks, or 32 *scheepels*.

At *Dordrecht*, into 3 *hoedts*, 24 sacks or *vaaten*, or 96 *achtendeelen*.

At *Gorcum*, into 2 *hoedens*, and 5 *achtendeelen*.

At *Breda*, into  $33\frac{1}{2}$  *viertelen* of wheat, or 29 *viertelen* of oats.

At *Utrecht*, into 25 muddes.

At *Amersfort*, into 64 *scheepels*.

At *Middleburg*, into  $41\frac{1}{2}$  sacks, or 83 *achtendeelen*.

At *Flushing* and *Ter-Veer*, into 39 sacks.

At *Zirkzee*, *Ter-Goes*, *Bommen*, *Ter-Toolen*, *Stavenes*, and *Duyveland*, into  $37\frac{1}{2}$  sacks.

At *Groningen*, into 33 muddes.

At *Deventer*, into 36 muddes, or 144 *scheepels*.

And in *Friesland*, into 18 barrels, 33 muddes, or 36 *loopers*.

A *hondert* of salt consists of 404 *maaten*, and weighs 40000 pounds of Amsterdam.

A *hoedt* of pit coal is 38 *maaten*.

An *ahm* or *aam* of gin is composed of 4 *ankers*, 8 *stekanen*, 21 *viertels*, 64 *stoopen*, 128 *mingelen*, or 256 pints.

The *tonne* or barrel of beer contains 128 *mingelen*.

The *oxhooft* consists of  $12\frac{1}{2}$  *stekanen*, or 200 *mingelen*.

The foot consists of 4 palms, or 11 inches; the inch is divided into 24 parts.

The palm, which is used for measuring timber and masts, is 42



lines of France, or very nearly  $44\frac{1}{4}$  lines of England ; and its diameter is 14 lines of France, or very nearly  $14\frac{1}{2}$  lines of England.

The morgen, land measure, consists of 600 ruthes, and the ruthe is 13 feet of Amsterdam.

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#### ANCONA.

Accounts are kept at Ancona in scudi, each scudo consisting of 20 soldi, and each soldo of 12 denari ; they are also kept in scudi of 10 paoli, the paolo of 10 bajocchi ; and sometimes in scudi of 100 bajocchi.

The following is the relation of these monies.

1 scudo is equivalent to 10 paoli, 20 soldi, 80 bolognini, 100 bajocchi, 240 denari.

All the coins of Rome are current at Ancona, without any difference either in their name or their value.

The weight used in this city is 2 per cent lighter than that of Leghorn.

The rubbo, measure for corn, is 8 lappe ; and the soma, measure for liquids, is 8 boccali.

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#### ANTWERP.

At Antwerp, Brussels, and in the late states of Brabant and Flanders, accounts are kept in *guldens* or florins, each florin consisting of 20 patars, and each patar of 12 pennings.

A pound Flemish, or *pond Vlaams*, is  $2\frac{1}{2}$  rixdollars, 6 florins, 20 shillings, 120 patars or stivers, 240 grotes, 1920 pennings, or 5760 mytens.

These monies are distinguished by the appellation of exchange money and current money, the former being  $16\frac{2}{3}$  per cent better than the latter ; whence 6 florins exchange money make 7 florins current money.

The coins of the Austrian Netherlands were as follow :

Of gold : the souverain, or severin, of  $8\frac{1}{4}$  florins of exchange, or  $9\frac{5}{8}$  florins currency ; the double and the half souverain, in the same proportion ; the Austrian ducat of  $5\frac{9}{20}$  florins of exchange, or  $6\frac{7}{20}$  florins currency.



Of silver: the *ducaton*, or ducatoon, of  $3\frac{1}{20}$  florins of exchange, or 3 florins  $11\frac{1}{2}$  patars currency; the *croon*, or crown, of  $2\frac{1}{10}$  florins of exchange, or  $3\frac{3}{20}$  florins currency.

Of silver and copper: the new shilling of 6 patars of exchange, or 7 patars currency; the old shilling of  $6\frac{3}{4}$  current patars; the pieces of 5,  $2\frac{1}{2}$ , and 1 current patar; and the plaquette of  $3\frac{1}{2}$  current patars.

Of copper: the pieces of 2 and 1 orts; and the duyte of 2 pennings currency.

The marc, for weighing precious metals, consists of 8 ounces, the ounce of 8 estelins or engels, and the estelin of 32 as; whence the marc, which is equal to that of Amsterdam, and has the same denomination of troy-weight. is 5120 as.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains; and in the assaying of silver, into 12 pennin-gen, or pennyweights, each into 24 grains.

A marc of gold of the purity of  $22\frac{3}{4}$  carats, inclusive of  $\frac{3}{4}$  of an estelin for the remedy of the weight, and of  $\frac{3}{4}$  of a grain for the remedy of the alloy, was coined into  $44\frac{932}{5733}$  souverains, and the other coins founded upon that denomination in the same proportion.

A marc of silver of the purity of 10 pennyweights and  $11\frac{1}{2}$  grains, inclusive of 1 estelin for the remedy of the weight, and of 1 grain for the remedy of the alloy, was coined into  $7\frac{7}{20}$  ducats.

A marc of silver of the purity of 6 pennyweights and  $23\frac{1}{2}$  grains, inclusive of  $1\frac{1}{2}$  estelin for the remedy of the weight, and of  $1\frac{1}{2}$  grain for the remedy of the alloy, was coined into  $49\frac{5}{96}$  shillings Flemish.

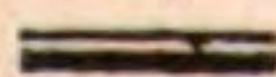
The pound consists of 2 marcs, or 16 ounces; but each marc is  $4\frac{1}{3}$  per cent lighter than that which is used for weighing precious metals.

The schippondt is composed of 3 centners, or 300 pounds; the centner, or quintal, is 100 pounds; the *steen*, or stone, 8; the *wagge*, 165; and the load 400.

A viertel of corn measures 4 muckes.

The last of Amsterdam is about  $37\frac{1}{4}$  viertels of Antwerp, or 25 sacks of Brussels.

A pipe of wine contains 152 stoopens; the aam 50; and a barrel of beer 54.





## ARRAGON.

At Saragossa, and in the other parts of this titular kingdom, accounts are kept in libras jaquesas, each libra consisting of 20 sueldos, and each sueldo of 16 dineros of plate. The libra is composed of 10 reals of old plate, and is therefore worth 18 reals and 28 maravedis, or 640 maravedis of vellon : thus, the sueldo is 8 quartos, and the dinero 1 ochavo, or 2 maravedis of vellon.

16 hard dollars correspond with 17 libras jaquesas

5 pistoles of exchange..... 16 ditto

5 dollars of exchange..... 4 ditto

68 ducats of exchange ..... 75 ditto

4 doubloons ..... 68 ditto.

The libra, or pound pensil, weight for rough goods, consists of 12 ounces ; and the libra used for weighing meat and fish is composed of 36 ounces.

The quintal consists of 4 arrobas, or 144 pounds of Arragon, equivalent to 108 pounds of Castille ; and the arroba is 36 pounds of 12 ounces each, or 27 pounds of Castille.

A cahiz of corn consists of 8 fanegas, 24 quartales, 96 almudes or celemines. The fanega is 12 celemines, and is equivalent with  $4\frac{1}{2}$  celemines of Castille ; whence 79 fanegas of Castille make 192 fanegas of Arragon.

The nietro, or carga of wine, of Arragon, consists of 16 cantaras ; each cantara, or arroba, is 28 pounds of Arragon, or 21 pounds of Castille.

17 cantaras of Arragon are 84 azumbres of Castille.

The vara of Arragon is 398 lines of Castille.

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AUGSBURG.

Accounts are kept in guldens of 60 kreutzers, or cruitzers, the cruitzer of 4 pfenings.

The *thaler*, or rixdollar, is  $1\frac{1}{2}$  gulden, or 90 cruitzers.

The gulden is also divided into 15 batzes, or 20 kaysergroschen ; and the batze is  $1\frac{1}{3}$  kaysergroschen, 4 cruitzers, or 16 pfenings.

These monies are distinguished into exchange money, current money, and *weisse muntzen*, or white money.

The current money, which is the same as that denominated *convention*, is 27 per cent less than exchange money, in which bills



of exchange are paid ; and 20 per cent more than white money, which is itself to exchange money as 100 are to  $47\frac{2}{3}$ .

The coins of Augsburg are as follow :

Of gold : the ducat, which is worth 4 guldens 12 cruitzers current money, with an agio of 3 or 4 per cent ; the gold gulden of 3 guldens current money.

Of silver : the reichsthaler especie de constitution, of 2 guldens 12 cruitzers ; and the reichsthaler especie de convention, of 2 guldens, the whole in current money.

Of silver and copper : the gulden of 60 cruitzers ; the half gulden of 30 cruitzers ; and the pieces of 20, 15, 12, 10,  $7\frac{1}{2}$ , 5, 4, 3,  $2\frac{1}{2}$ , 2, and 1 cruitzer, white money.

The marc, for weighing precious metals, consists of 16 loths, 64 quintins, or 256 pfenings, and is 1 per cent heavier than that of Cologne.

487 marcs of Amsterdam make  $507\frac{5}{8}$  marcs of Augsburg.

In the assaying of gold, the marc is divided into 24 *karatten* or carats, and each carat into 12 grains.

In the assaying of silver, the marc consists of 16 loths, each loth of 4 quintins, or 16 pfenings.

Gold and silver are sold at so many current guldens per marc fine of Augsburg.

The *centner* or quintal is composed of 100 pounds, and there are two sorts of pounds.

The pound, weight for rough goods, denominated *pfund kramgewicht*, consists of 32 loths, each loth being  $\frac{5}{8}$  of a pfening heavier than the loth used for weighing precious metals ; and  $33\frac{1}{4}$  loths of the latter weight compose the *pfund frohngewicht*, or pound used in respect to the cartage of goods ; whence 100 pounds commercial weight correspond with  $96\frac{1}{4}$  pounds carriers' weight, and with  $200\frac{1}{4}$  marcs, weight for precious metals.

A schaf of corn consists of 8 metzes ; the metze of 4 vierlings ; and the vierling of 16 meesles.

The fuder is composed of 8 jez, 16 muddens, 96 besons, 768 maas, 1536 seidels, 3072 quarters, 6144 achtels.

Two ells are used at Augsburg for measuring cloth, and the *fuss*, or foot, is half of the shortest.

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## BARCELONA.

Accounts are kept at Barcelona, and in the other cities of Catalonia, in libras catalanas, each libra consisting of 20 sueldos, and each sueldo of 12 dineros.

The relation between the libra and all its divisions is as follows :

1 libra catalana is equivalent to  $6\frac{2}{3}$  catalan reals of plate, 10 reals ardites, 20 sueldos, 240 dineros, 480 mallas ; hence 2 catalan reals of plate correspond with 3 reals ardites.

The pistole of exchange is worth 5 libras 12 sueldos ; the ducat of exchange 38 sueldos and  $7\frac{4}{7}$  dineros ; the dollar of exchange 28 sueldos ; the real of plate  $3\frac{1}{2}$  sueldos ; and the real of vellon  $22\frac{1}{2}$  dineros ; wherefore

|                               |                         |
|-------------------------------|-------------------------|
| 5 dollars of exchange make .. | 7 libras catalanas      |
| 5 pistoles of exchange .....  | 28 ditto                |
| 272 ducats of exchange .....  | 525 ditto               |
| 136 ditto .....               | 2625 reals ardites      |
| 68 ditto .....                | 2625 sueldos catalanes. |

The national coins of Spain are of the undermentioned value in Catalonia :

The doubloon, 30 libras ; the hard dollar,  $37\frac{1}{2}$  sueldos ; the peseta Mexicana, 9 sueldos  $4\frac{1}{2}$  dineros ; and the peseta provincial,  $7\frac{1}{2}$  sueldos.

The quintal, weight for rough goods, consists of 4 arrobas, each arroba of 26 pounds of 12 ounces each ; whence the quintal is 104 pounds of Catalonia, which correspond with 91 pounds of Castille.

A quartera of corn contains 12 cortanes.

The salma is composed of 4 quarteras, or 48 cortanes ; and the carga of  $2\frac{1}{2}$  quarteras, or 30 cortanes.

100 quarteras of Catalonia are 128 fanegas of Castille.

The carga, measure for liquids, consists of 12 arrobas, each arroba of 26 pounds.

A carga of wine and of brandy measures 16 cortanes, 32 quarteras, or 128 quartillos of Catalonia ; and a carga of oil is 11 arrobas, 30 cortanes, or 120 quartos.

The regular pipe of wine is 4 cargas, and that of Majorca oil is 110 cortanes.



The *cana catalana* is divided into 8 palmos, each palmo into 4 quartos; and 100 varas of Castille are equal to  $54\frac{1}{2}$  canas of Catalonia.

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#### BASIL OR BASLE.

Accounts are kept in this city of Switzerland in livres, each livre consisting of 20 sols, and each sol of 12 deniers.

The *reichsthaler*, or rixdollar, is  $1\frac{4}{5}$  florin, 3 livres, 27 good batzes, 36 gros, 45 plapperts, 60 sols, or 108 cruitzers.

The *gulden*, or florin, is  $1\frac{2}{3}$  livre, 15 good batzes, 20 gros, or 60 cruitzers.

The livre is 9 good batzes, 12 gros, 20 sols, or 240 deniers.

The good batze is  $1\frac{1}{3}$  gros,  $1\frac{2}{3}$  plappert,  $2\frac{2}{9}$  sols, 4 cruitzers, 10 rappens, 20 fenins,  $26\frac{2}{3}$  deniers.

The coins of Basle are as follow:

Of gold: the ducat of  $4\frac{1}{4}$  florins.

Of silver: the rixdollar of 3 livres, or 2 florins; the florin of 15 batzes.

Of silver and copper: the pieces of 3, 2, and 1 batze, and of 1 cruitzer.

There are two sorts of monies: current money, which consists in the effective coins of Switzerland; and exchange money, in those of foreign countries. 3 livres tournois are equivalent to 2 livres exchange money, 9 pieces of which make 10 pieces current money.

The marc of Cologne is used at Basle for weighing precious metals, and the French pound, poids de marc, for rough goods.

A sack of corn consists of 8 muddes, or scheffels; each mudde of 4 kupfleins, or 8 beches.

A saum of wine contains 8 ohms; and the ohm 32 old pottles, or 40 new pottles.

Two measures are used for cloth, the aune and the brasse; 6 aunes make 13 brasses.

The juchart, land measure, is 140 square ruthes, and the ruthe is 16 feet.

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#### BATAVIA.

Accounts are kept in rixdollars, each rixdollar consisting of 60 light stivers.



The rixdollar is reckoned 64 stivers in respect to the payment of salary, &c.

The coins of the island of Java are as follow :

|                                                                           | £ s. d.         |       |
|---------------------------------------------------------------------------|-----------------|-------|
| 1 doit..... = 1 cash or doubleskye..                                      | 0 2.5           |       |
| 3 cash or doubleskyes .. = 1 sattalie .....                               | 0 7.5           |       |
| 6 cash or 2 sattalies.... = 1 sooka .....                                 | 1 3             |       |
| 15 cash .....                                                             | = 1 rupee ..... | 3 1.5 |
| 24 cash or 48 stivers .... = 1 rixdollar .....                            | 5               |       |
| 39 cash or 13 skillings .. = 1 ducatoon.....                              | 8 1.5           |       |
| 1 rixdollar is 60 light stivers or 64 paid on account of salary, &c. .... | 5               |       |
| 1 gold ducat is 2 rixdollars 12 stivers, or 18 skillings .....            | 11 8            |       |
| 1 Japan coopang stamped is current for 30 rixdollars .....                | 7 10            |       |

The bahaar consists of 3 pekuls, or 300 catties, and is equal to 16 Madras maunds 1 vis 24 pollams, or 375 lbs avoirdupois.

The pekul of 100 catties is 125 pounds avoirdupois.

The tael, for weighing gold, amber, musk, and bezoar, corresponds with 724 as of Holland, and is about 537 grains troy-weight.

The last is 46 measures, or 230 gantoms ; and the measure consists of 5 gantoms = 3066 $\frac{2}{3}$  lbs avoirdupois.

A leaguer of arrack is 396 ranns, and of wine 360.

An ell is 27 inches, and a foot 12.

#### BAYONNE.

Accounts are kept in this city of France in francs and cents.

The coins of France are current without any difference either in their denomination or value.

The pound, poids de marc, is used at Bayonne.

A sac of corn is 2 conques.

The muid, liquid measure, contains 320 pintes, and the pinte 2 chopines, or 4 demi septiers.

#### BEETLEFAKEE.

In this city of Arabia, accounts are kept in piastres of 80 cabirs or caveers.



Spanish dollars are the most current coin at Beetlefakee: 100 dollars correspond with  $121\frac{1}{2}$  piastres.

The bahaar consists of 40 frazils, or 400 maunds, and weighs 814 pounds troy-weight.

A maund of coffee is 2 rattles, and a rattle  $14\frac{1}{2}$  vakias, 290 of which make a frazil.

The rattle, for all other goods, is 15 vakias; but it is only used in the bazar, or market-place.

Cotton is sold per harrafs, money of account, 9 of which are equal to  $11\frac{1}{2}$  Mocha piastres.

A tommand of rice is 40 kellas, and weighs 168 pounds avoirdupois.

The gudda, liquid measure, is 8 nufieahs, and the nufieah is 16 vakias.

A long iron coid is 27 inches, a coid 18, and a guz 25.

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### BENGAL.

Accounts are kept in current rupees, each rupee consisting of 16 current annas, and each anna of 12 current price.

All specie must be reduced into this currency before any sum can be entered into books of accounts.

A gold mohur, or rupee, weighs 7 dwts  $8\frac{1}{2}$  grains troy, and passes for  $14\frac{1}{2}$  to  $15\frac{1}{2}$  silver rupees. The most common silver coin is the rupee denominated sicca, which weighs 7 dwts 11 grains, and has the same divisions as the current rupee.

Cowries, or sea shells, which are made use of for paying coolies, are thus reckoned: 4 cowries make 1 gunda; 20 gunda, 1 punn; 32 punns, 1 current rupee; whence 1 rupee is 2560 cowries, which however rise or fall according to their abundance or scarcity.

The relative value of the several denominations of rupees generally used in keeping accounts is as follows:

|                                           |                    |
|-------------------------------------------|--------------------|
| 100 sicca rupees of Calcutta make . . . . | 116 current rupees |
| 100 Arcot rupees . . . . .                | 108 ditto          |
| 100 Bombay rupees . . . . .               | 110 ditto          |
| 100 Sonaut rupees . . . . .               | 111 ditto.         |

A lak is composed of 100,000 rupees.

Grain is sold by the khahoon of 16 soallee, equal to 40 maunds.



Liquids, by the chatack of 5 sicca rupees weight ; 16 chatacks 1 pouah ; 4 pouah 1 seer ; 40 seers 1 maund.

Three grains in long measure make 1 finger ; 4 fingers 1 hand ; 3 hands 1 span ; 2 spans 1 arm or cubit ; 4 arms 1 fathom ; 1000 arms or 4000 cubits 1 coss or Bengal mile, equal to 1 English mile, 1 furlong, 3 poles,  $3\frac{1}{2}$  yards.

Cloth is measured by the haat or cubit of 8 gheria equal to 18 inches ; and by the guz of 36 inches, equal to an English yard.

Land is measured by the haat or cubit of 18 inches ; 5 of those cubits long and 4 broad make 1 chatack ; 16 chatacks 1 cottah ; 20 cottahs 1 biggah, equal to 1440 square feet ;  $30\frac{1}{4}$  biggahs are 1 English statute acre, and 40 biggahs are 1 Madras cawney.

The Bengal factory maund consists of 40 seers, and each seer of 16 chittacks weighs 1 pound 13 ounces  $13\frac{1}{3}$  drams avoirdupois, according to the standard received from England in 1787.

The Bengal bazar maund is 10 per cent heavier than that of the factory, and corresponds with 82 pounds  $2\frac{1}{8}$  ounces avoirdupois.

The relation between the several denominations of great weights used in different parts of India is as follows :

|                                                                             | Bengal Factory. |    |                | Avoirdupois. |     |     |
|-----------------------------------------------------------------------------|-----------------|----|----------------|--------------|-----|-----|
|                                                                             | M.              | S. | C.             | lbs.         | oz. | dr. |
| A candy of 20 maunds of Madras is ..                                        | 6               | 28 | 0              | 500          | 0   | 0   |
| A candy of 150 vis of Pegu.....                                             | 6               | 28 | 0              | 500          | 0   | 0   |
| A bahar of 8 capins of Jonkceylon....                                       | 6               | 20 | 0              | 485          | 5   | 5   |
| A bahar of 3 piculs of Malacca .....                                        | 5               | 16 | 11             | 405          | 0   | 0   |
| A picul of 50 catties of Siam .....                                         | 1               | 29 | 10             | 129          | 0   | 0   |
| A candy of 20 maunds of Anjengo ....                                        | 7               | 20 | 0              | 560          | 0   | 0   |
| A candy of 20 maunds of Cochin .....                                        | 7               | 11 | 0              | 543          | 8   | 0   |
| A candy of 20 maunds of Tellicherry..                                       | 8               | 0  | 2              | 600          | 0   | 0   |
| A candy of 20 maunds of Goa.....                                            | 6               | 25 | 2              | 495          | 0   | 0   |
| A candy of 20 maunds of Bombay .....                                        | 10              | 7  | 2              | 760          | 0   | 0   |
| A candy of 20 maunds of Surat .....                                         | 10              | 0  | 0              | 746          | 12  | 0   |
| A maund seffy of Bussorah.....                                              | 1               | 8  | 5              | 90           | 4   | 0   |
| A maund á tary of Bussorah .....                                            | 0               | 15 | $4\frac{1}{3}$ | 28           | 8   | 0   |
| The custom-house maund of Muscat, by<br>which gross articles are weighed .. | 0               | 4  | 11             | 8            | 12  | 0   |
| A bahar of 15 frazell of Mocha .....                                        | 5               | 38 | 6              | 445          | 0   | 0   |
| A picul of 100 catties of Canton .....                                      | 1               | 1  | 6              | 133          | 5   | 5   |

A gonge, or a measure of rice, is 5 seers, and the covid of cloth is 9 inches.

#### BERGAMO.

In this part of Lombardy, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari, currency.



There are two sorts of weights ; the pound, *peso sottile*, of 12 ounces, for weighing silks, cochineal, indigo, and grocery ; the pound, *peso forte*, of 30 ounces, for weighing gross articles.

A somma of corn is 8 satari ; and the brenta, for measuring liquids, contains 52 pinti.

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#### BERGEN.

In this city of Norway, accounts are kept in *ryksdales*, or rix-dollars, of 6 marcs, each marc of 16 skillings Danish ; but at Christiana, Drontheim, Fleckeren, Koperwick, Laarvig, Romsdal, and in some other cities of Norway, the rixdollar is divided into 4 orts, and the ort into 24 skillings Danish.

All the coins of Denmark are current in Norway, and the description of each is inserted under the head of Copenhagen.

The skipond is 20 lisponds, or 320 pounds.

The centner consists of 6 $\frac{1}{2}$  lisponds, or 100 pounds.

The waag, or vog, is 3 bismersponds, or 36 pounds.

The lispond is 16 pounds, and the bismerspond 12.

The *skaalpond*, or pound, consists of 32 lods.

A last of corn measures 12 tœndes, and that of salt 18.

A tœnde of corn contains 144 krœge, of salt 136, and of pitch 120.

The other measures are the same as those used in Denmark.

Masts and timber are measured by palms, each of which is about 41 $\frac{7}{8}$  lines English.

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#### BERLIN.

Accounts are kept at Berlin, Magdeburg, Francfort on the Oder, and in some other cities of the electorate of Brandenburg, in *thalers*, or rixdollars, each rixdollar consisting of 24 gute groschen, or good groschen, and the good groschen of 12 pfenings : but, since the establishment of the Bank of Berlin, accounts are also kept in pounds banco, each pound of 24 groschen banco, or 30 good groschen, and the groschen of 12 pfenings.

The coins of Prussia are as follow :

Of gold : the Frederick of 5 rixdollars ; the double Frederick and the half Frederick of proportionate value ; the ducat, which is reckoned 2 $\frac{3}{4}$  rixdollars.



Of silver: the rixdollar of 24 good groschen; and the pieces of 12, 8, 4, 2, 1 good groschen.

Of copper: pieces of 3 and 1 pfening.

Silver currency loses from  $5\frac{1}{2}$  to 6 per cent in respect to gold currency, according to the abundance or scarcity of the former.

100 pounds banco are equal to  $131\frac{1}{4}$  rixdollars silver currency.

The marc, for weighing gold and silver, is divided in the same manner as the marc of Cologne; but Mr. Tillet found the former 5 grains heavier, which corresponds exactly with the observations of Kruse.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains; and in the assaying of silver, the marc is divided into 16 loths, the loth into 18 grains: thus each marc is composed of 288 grains.

The coinage of gold and silver is regulated since 1764, as follows:

A marc of gold of the purity of  $21\frac{3}{4}$  carats is coined into 35 Fredericks; and a marc of silver of the purity of 12 loths is coined into  $10\frac{1}{2}$  rixdollars; the other coins in the same proportion.

Gold coinage is to silver coinage in the ratio of 1 to  $14\frac{4}{9}$ .

The schipfund consists of 20 lispfunds, or 280 pounds; and the lispfund of 14 pounds.

The centner is composed of 5 stone, or 110 pounds; and the *stein*, or stone, of Berlin is 22 pounds.

The *pfund*, or pound, consists of 2 marcs, or 32 loths; and each loth is divided into 4 quintelins, 16 pfenings, or 32 hellers.

A last of corn is 3 wispels, and that of oats and of barley only 2.

The wispel measures 2 malters, 24 scheffels; and the scheffel is 4 viertels, 16 metzens, or 64 messgens.

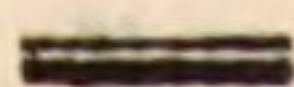
A fudder of wine contains 4 oxhofts, 6 ohms, 12 eimers, 24 ankers, 768 nass, or 1536 næssels.

A guebrande of beer is 9 kupen, 18 fass, 36 tonnen, 144 aemjen, 3456 quartels, or 6912 næssels.

The hufe, land measure, is 30 great morgens; and the little hufe, or hacken, is 2 great morgens.

The great morgen is 400 square ruthes, and the little morgen 180.

The ruthe is 12 feet of the Rhine.





## BERN.

Accounts are kept at Bern in livres, each livre consisting of 20 sols, and each sol of 12 deniers. The livre is also divided into 10 batzes, and the batze into 4 cruitzers.

A *couronne*, or crown, is  $2\frac{1}{2}$  livres, 25 batzes, 50 sols, 100 cruitzers, 600 deniers; and the gulden is 4 batzes, or 8 sols.

The coins of Bern are as follow:

Of gold: the ducat of 7 livres, or 70 batzes.

Of silver: the patacon of 3 livres 6 sols.

Of silver and copper: pieces of 5, 1,  $\frac{1}{2}$  batze, and of 1,  $\frac{1}{2}$  cruitzer.

Foreign coins are current at Bern at prices which vary according to circumstances.

The marc, for weighing gold and silver, consists of 8 ounces, 16 loths, or 3808 grains, and corresponds with 3813 grains troy-weight.

The apothecaries make use of a weight which is also composed of 8 ounces, or 16 loths, but is lighter, since it is only equivalent to 3654 grains troy-weight.

The pound, commercial weight, is 16 ounces, 32 loths, or 128 quintleins.

This weight varies in the other cities of the canton of Bern; for, if the weight of Bern be supposed to contain 10000 parts, it contains at Lausanne 9727, at Morges 9729, at Nion 10959, at Romain-Mottier 10271, at Iverdun 10326, at Granson 9674, at Payerne 9674, at Gessenay 10525, at Vevai 10995, at Arau 9347, at Thoun 10289, at Zoffingen 9528, at Brouck 10489, at Berthoud 9872, and at Buren 10326.

A mut or mutte of corn is 12 berner mass, 48 immis, 96 achterlis, 192 sechzenerlis.

The land fass, liquid measure, is 8 saums, the saum 4 eimers, and the eimer 25 maas.

The juchart, land measure, is 5000 pas; the pas, field measure, is  $6\frac{1}{4}$  square pieds; and the pas, for measuring forests, is 9 square pieds.

The ruthe is 6 pieds of Bern.



## BILBOA.

Accounts are kept at Bilboa, and in the other cities of Biscay, in reals of vellon, each real of 34 maravedis.

The other coins are inserted under the head of Spain.

The quintal macho, used in Biscay for weighing iron, consists of 146 pounds of Bilboa, each pound of 17 ounces; and the same quintal corresponds with  $155\frac{1}{8}$  pounds of Castille, each of 16 ounces.

At Bilboa goods are weighed by the Bilboa pound of 17 ounces of Castille each; and at Santander and Victoria by the pound of Castille of 16 ounces.

The fanega of Bilboa, which is composed of 12 celemines, or 48 quartillos, is 6 per cent larger than that of Castille; whence 100 fanegas of Bilboa are equal to 106 of Castille.

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BOLOGNA.

Accounts are kept in this city of Italy in lire, each lira consisting of 20 soldi, and each soldo of 12 denari.

The lira is also divided into 2 paoli, or giuli, or 120 quatrini.

A paolo, or giulo, is 10 soldi, 60 quatrini, or 120 denari.

A soldo, bajoccho, or bolognino, is 6 quatrini, or 12 denari.

The scudo di cambio, or pezza da otto reali, is 85 soldi; wherefore 4 scudi are 17 lire.

Bank money is 3 per cent better than currency.

The coins of Bologna are as follow:

The petrono, or testono, of 3 paoli, or 30 soldi; the giustino of 26 soldi; the giulo of 10 soldi; the marajolo of 2 soldi; the soldo, bajoccho, or bolognino, of 6 quatrini; and the bagherona of 3 quatrini.

The pound is 12 ounces.

A corba of corn consists of 2 stari, 8 quartorini, or 32 quaticini.

The corba, liquid measure, is 60 boccali.

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BOLZANO.

In this city of Tyrol, accounts are kept in gulden, each gulden consisting of 60 kreitzers, or cruitzers, and each cruitzer of 4 pfenings.



The *reichsthaler*, or rixdollar, is  $1\frac{1}{2}$  gulden, 90 cruitzers, or 360 pfenings.

These monies are distinguished by three appellations, namely, *moneta del giro*, *moneta lunga*, and *mess-valuta*.

*Moneta del giro*, or exchange money, consists in the Spanish doubloons, and the French louis d'or; and *moneta lunga*, or current money, in the silver currency of Austria. In respect to *mess-valuta*, it means an agio from 5 to 6 per cent, which the merchants allow at fair time upon the value of the several coins, in order to procure a ready sale of their goods.

The saum is 4 centners, and the centner is 100 pounds.

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### BOMBAY.

Accounts are kept in rupees, each rupee consisting of 4 quarters, and each quarter of 100 reis.

Their coins, real and imaginary, are as follow:

|                                      |                              |
|--------------------------------------|------------------------------|
| 2 *reas                              | = 1 urdee                    |
| 4 reas                               | = 1 dooganey, or single pice |
| 6 reas, or 3 urdees                  | = 1 doreea                   |
| 8 reas, or 4 urdees                  | = 1 fuddea or double pice    |
| 3 and $\frac{1}{2}$ fuddeas, or pice | = 1 *anna                    |
| 12 $\frac{1}{2}$ pice, or 4 annas    | = 1 *quarter rupee           |
| 25 pice, or 8 annas                  | = 1 half rupee               |
| 50 pice, or 16 annas                 | = 1 rupee                    |
| 5 rupees, or 80 annas                | = 1 paunchea                 |
| 15 rupees                            | = 1 gold mohur.              |

The seer, small or silver weight, is 24 tolas; the tola, or 1 rupee, 40 valls; the vall  $2\frac{1}{2}$  gonze; and the gonze 6 chowe.

Silver is commonly sold from 90 to 100 doganies, or single pice, per tola; but computations in money are made by the fuddeas, or double pice.

The candy, or Bombay great weight, consists of 20 maunds, the maund of 40 seers, and the seer of 30 pice. The maund is equal to the English quarter.

The candy, measure for wheat and all grain except rice, consists of 8 parahs; the parah of 16 adowlies; the adowly, or pily, of 4 seers; and the seer of 2 tiprees.

A moora of rice is 4 candies, or 25 parahs; a candy  $6\frac{1}{4}$  parahs; a parah 20 adowlies; an adowly  $7\frac{1}{2}$  seers; and a seer 2 tiprees.

\* Imaginary.



A bag of rice weighs 6 maunds, or 168 pounds avoirdupois; and a candy is equal to about 25 bushels.

A rash of salt is 16 annas, 40 tons, or 1600 baskets.

The cuz, long measure, is 28 inches, or tussoo, and the heat 18; but the English yard of 36 inches is in common use.

Piece goods, and a few other articles, are sold by the corge of 20 pieces.

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#### BORDEAUX.

Accounts are kept in francs, each franc consisting of 100 cents; and all the coins current in France are equally received at Bordeaux.

The pound is 16 ounces poids de marc.

The effective weight of the quintal of Bordeaux is 101 pounds poids de marc; of the half quintal 50½ pounds; and of the quarter of a quintal 25¼ pounds; but in business these weights are only reckoned 100, 50, and 25 pounds, the difference being in favour of the purchaser. The smaller weights are exact.

A boisseau of corn is divided into several inferior measures, from  $\frac{1}{2}$  to  $\frac{1}{16}$  parts; and 2 boisseaux of Bordeaux are the septier of Paris.

A tonneau of wine is composed of 4 barriques; the barrique contains from 100 to 108 pots; and the pot of Bordeaux is 2½ pintes of Paris, or 2 litres 27 millilitres, new measure.

Brandy is sold per 50 velts, and a puncheon contains about the same quantity.

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#### BRASIL.

Accounts are kept in reis.

The pataca, silver coin of Brasil, is current there for 320 reis, and in Portugal only for 240.

The copper coins of Portugal are received in Brasil for double their value.

The weights and measures used in that country are the same as those of Portugal.

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#### BREMEN.

Accounts are kept in this Imperial and Anseatic town in *thalers*, or rixdollars, each rixdollar consisting of 72 groschen, and each groschen of 5 current schwares.



A rixdollar is  $2\frac{1}{4}$  marcs, 6 kopfstuckes, 16 dutgens, 18 flinriches, 48 shillings, 72 groschen, 360 schwares.

The coins of Bremen are as follow :

Of gold : the ducat of  $2\frac{1}{4}$  rixdollars.

Of silver : the reichsthaler de especie of  $1\frac{1}{2}$  rixdollar current.

Of silver and copper : the kopfstucke of 12 groschen, or 60 schwares ; and pieces of 6, 3, 2, and 1 groschen.

Of copper : the schware of 4 pfenings.

The marc, for weighing precious metals, is equal to that of Cologne.

The pound, for weighing rough goods, consists of 2 marcs, 16 ounces, 32 loths, 128 quintins, or 512 orts.

The pfund schwer is 300 lbs, and in respect to the cartage of goods 308.

The schipfund is composed of  $2\frac{1}{2}$  centners, or 290 pounds.

The centner is 116 pounds ; the lispfund 14 ; the stein of flax 20, and that of wool 10.

The last measures 4 quarts, 40 scheffels, 160 viertels, 640 spints.

A fuder, or tun of wine, contains 6 ohms, 270 stubgens, or 4320 mengels : a stubgen is 16 mengels.

An oxhoft, or puncheon of brandy, contains 30 viertels.

A tonne of oil is 6 stechkannen, or 96 mengels.

An ell is 2 feet of Bremen.

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BRESLAU.

Accounts are kept at Breslau, and in the other cities of Silesia, in *thalers*, or rixdollars current, each rixdollar consisting of 30 silver groschen of 12 pfenings.

The pound banco of Berlin is 30 good groschen, or 360 pfenings.

The reichsthaler de especie is  $1\frac{1}{2}$  rixdollar current, or 40 silver groschen.

The rixdollar current is  $1\frac{1}{4}$  thaler of Silesia, which is thus divided :

A thaler of Silesia is  $1\frac{1}{2}$  gulden,  $19\frac{1}{2}$  good groschen, 24 silver groschen, 36 weisse groschen, 72 kreitzers, 96 groschels, or 288 denares.

A kreitzer is also divided into 2 dreyers, and a dreyer into 3 hellers.



These monies are generally reckoned by schocks of 60 and 40 silver groschen, and by marcs of 32 and 16 silver groschen, and 32 weisse groschen.

|                                 |                       |
|---------------------------------|-----------------------|
| 3 reichsthalers de espeeie make | 4 rixdollars current  |
| 4 rixdollars current.....       | 5 thalers of Silesia  |
| 5 thalers of Silesia .....      | 6 guldens ditto       |
| 6 guldens ditto.....            | 4 rixdollars current. |

The coins of Silesia are as follow :

Of gold : the Frederick of 5 rixdollars, bearing an agio of about  $6\frac{2}{3}$  per cent ; the ducat of 90 silver groschen.

Of silver : the rixdollar current of 30 silver groschen ; the half and the third of the rixdollar.

Of silver and copper : pieces of 4, 2, and 1 good groschen ; the timpfe, of 18 Polish groschen, or 6 silver groschen ; and the silver groschen of 3 Polish groschen.

The marc, for weighing gold and silver, consists of 8 ounces, or 16 loths ; and each loth is divided into 4 quintels, 16 denares, or 32 hellers.

In the assaying of gold, the marc is divided into 24 carats ; and the carat into 4 grains, or 12 groenen.

In the assaying of silver, the marc consists of 16 loths, and the loth of 16 grains.

The schiffpfund is 3 centners,  $16\frac{1}{2}$  laeps or steins, or 396 pounds.

The pound is 16 ounces, 32 loths, 128 quintels, or 512 denares.

A malter of corn measures 12 scheffels, 48 viertels, 192 metzens, or 768 messcels.

An eimer, liquid measure, contains 8 topfs, 80 quarts, or 320 quartiers.

21 ells of Silesia make 22 ells of Breslau.

#### BRUNSWICK.

In this city, at Wolfenbuttle, Lunenburg, and in part of Westphalia, accounts are kept in thalers, each thaler consisting of 36 marien groschen, each of 8 pfenings.

A current thaler is  $1\frac{1}{2}$  gulden,  $1\frac{1}{3}$  marien gulden, 24 gute groschen, 36 marien groschen, 48 goesgens, 72 mathicærs, 288 pfenings.

The coins of Brunswick are as follow :



Of gold : the carl of 5 thalers ; the double and the half carl, in the same proportion ; the ducat of  $2\frac{3}{4}$  thalers.

Of silver : the reichsthaler de especie of 48 marien groschen ; the current thaler of 36 ; the gulden of 24 ; the half and the quarter gulden of proportionate value.

Of silver and copper : pieces of 3 and  $1\frac{1}{2}$  marien groschen ; of 2 and  $\frac{1}{2}$  gute groschen ; of 6 and 4 pfenings.

The marc, for weighing precious metals, is very nearly equal to that of Cologne ; and a marc of gold of the purity of  $21\frac{3}{4}$  carats is coined into 35 carls.

The schifpfund is composed of 20 lispfunds, or 280 pounds ; the centner of 114 pounds ; and the stein of 10.

A wispel of corn measures 4 scheffels, 40 himtens, or 640 lœchers.

A fuder of wine contains 6 ahms, 240 stubgens, or 1920 nœssels.

The ruthe is 16 feet, the ell 2, and the foot is 12 inches.

#### BUSSORAH.

In this city, situated in Irac Arabia, accounts are kept in mamudis of 10 danimos, the danimo of 10 fluches.

A toman consists of 100 mamudis.

The coins of Bussorah are as follow :

Of gold : the sequino misry of Cairo, which is worth  $13\frac{1}{2}$  mamudis ; the sequino gingerly, 15 mamudis ; the glani of Persia, 18 mamudis ; and the zecchino of Venice, 21 mamudis.

Of silver : the mamudi of Bussorah ; the old abassi of Persia, which is worth  $2\frac{1}{3}$  mamudis ; and the grucho of Turkey,  $4\frac{1}{2}$  mamudis.

Of copper : the danimo of 10 fluches.

The chequi, for weighing gold and silver, consists of 100 miscals, or 150 drachms ; and the miscal, of  $1\frac{1}{2}$  drachm, is about 72 grains troy-weight.

Two sorts of maunds are used at Bussorah ; the maund seffy, consisting of 76 vaquis á tary, and the maund á tary of 24 vaquis á tary.

The vaqui á tary is  $106\frac{2}{3}$  miscals, or 160 drachms.



The *vaqui-seffy*, or the *oka* of Bussorah, weighs  $333\frac{1}{3}$  miscals, or 500 drachms.

The *oka* of Bagdad is  $2\frac{1}{2}$  *vaquis á tary*, and weighs  $266\frac{2}{3}$  miscals, or 400 drachms.

The preceding is the mode of reduction of weights used by the Arabians; but the Europeans established at Bussorah have adopted the following :

The *vaqui á tary*, 25 of which are 1 maund, contains  $112\frac{8}{25}$  miscals, or  $168\frac{12}{25}$  drachms.

The *vaqui-seffy*, of  $3\frac{1}{8}$  *vaquis á tary*, is 351 miscals, or  $526\frac{1}{2}$  drachms.

The *oka* of Bagdad, of  $2\frac{1}{2}$  *vaquis á tary*, is  $280\frac{4}{5}$  miscals, or  $421\frac{1}{5}$  drachms.

The maund *seffy* consists of 3 maunds á tary, and each maund á tary is reckoned for 52 marcs, French weight, and contains 2808 miscals, or 4212 drachms.

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#### CADIZ.

Accounts are kept at Cadiz in *reales de plata antiguos*, or reals of old plate, each real consisting of 16 quartos, or 34 maravedis of old plate.

The *peso duro*, or hard dollar, is  $10\frac{5}{8}$  reals of old plate, 170 quartos, or  $361\frac{1}{4}$  maravedis of old plate.

The *peso di cambio*, or dollar of exchange, is 8 reals, 128 quartos, or 272 maravedis of old plate.

The other coins and monies of account are the same as those inserted under the head of Spain.

The quintal is composed of 4 arrobas, and the arroba of 25 pounds.

The pound is equal to that of Castille.

A bota of wine consists of 34 arrobas mayores, and each arroba of 34 pounds of 16 ounces each.

A pipa of oil is 32 arrobas menores, and each arroba 25 pounds.

25 arrobas mayores make 32 arrobas menores.

An arroba mayor, wine measure, is divided into 8 azumbres, or 32 quartillos, which are equal to those of Castille.



The cahiz measures 12 fanegas; and the fanega, which is the same as that of Castille, 12 celemines.

A last of salt is 4 cahices; and a fanega of cocoa weighs 110 pounds.

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CAIRO.

Accounts are kept in piastres of 33 medins.

The effective piastre is 60 medins, and the Spanish dollar is worth about 76 medins.

There are in Egypt different weights for the several descriptions of goods.

|                                                      | Rotolos. |
|------------------------------------------------------|----------|
| The cantaro, or usual quintal, is .....              | 100      |
| The cantaro of quicksilver and pewter...             | 102      |
| of coffee and wire .....                             | 105      |
| of nutmegs, salsa parilla, and elephants' teeth..... | 110      |
| of almonds and fruits .....                          | 115      |
| of dye woods .....                                   | 120      |
| of arsenic and other drugs ..                        | 125      |
| of gum arabic and balms ...                          | 133      |

A harsela, for weighing silk, is 400 drachms, and is equivalent to  $2\frac{1}{8}$  pounds avoirdupois.

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CALICUT.

Accounts are kept at Calicut and Tellicherry, on the coast of Malabar, in Gallee fanams, each fanam consisting of 16 tars, or vis.

A silver rupee is 5 gold fanams, or 80 silver tars; and a gold fanam is 16 silver tars.

The miscal, for weighing gold and silver, is composed of  $11\frac{1}{2}$  fanams, and corresponds with 2 pennyweights 21 grains troy-weight.

The candy consists of 20 maunds, and is 600 pounds avoirdupois; the maund is 40 seers, or 100 pools, and weighs 30 pounds avoirdupois.

5 Calicut maunds are equal to 6 Madras maunds.

A coid is 18 inches, and a guz  $28\frac{1}{2}$ .

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## CANARY ISLANDS.

In these islands, the principal of which are seven in number, and are all under the dominion of Spain, accounts are kept in *reales corrientes*, or current, each real of 8 quartos.

The pistole of 32 reals of plate is 40 current reals

The dollar of exchange ..... 10 ditto

The ducat of exchange .....  $13\frac{3}{4}$  ditto

The doubloon of 80 reals of vellon  $53\frac{1}{8}$  ditto

The hard dollar.....  $13\frac{9}{32}$  ditto.

85 current reals are equal to 128 reals of vellon.

The quintal is composed of 100 pounds, and the pound is nearly equal to that of Castille.

The pipa of wine, which is somewhat less than that of Spain, corresponds with about  $29\frac{1}{2}$  great arrobas.

The vara of the Canary isles is 1 inch longer than that of Castille.

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CANEIA.

In this city, and in all the island of Candia, accounts are kept in piastres of 80 paras.

The cantaro consists of 44 okas, or 100 rotolos. The oka is divided into 400 drachms, and the rotolo into 176.

This rotolo is denominated heavy, and there is another which is lighter.

A miscala of oil weighs  $8\frac{1}{2}$  okas, and 80 miscalas correspond with 236 gallons.

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CANTON.

Accounts are kept at Canton, and in all China, in *lyangos*, or tales, each tale consisting of 10 maces, and each mace of 20 candarines.

There is but one piece of coin in China, which is made of base metal, and called *cash*; it is used for paying coolies, labourers, and for small payments in the Bazar.

10 cash make a candarine, and 10 candarines make a tale; 3 of which are equal to a pound sterling.

The coin under consideration is composed of 6 parts of copper and of 4 parts of lead. It is round, stamped on one side only, and is rather raised at the edges, having four holes in the middle.



It is customary to collect the cash in number from 100 to 1000 upon a string.

In the assaying of gold and silver, the sycee, or the unit of reference, is divided into 100 parts, called touch; so that if a shoe of gold touch 92, it contains 92 parts of fine gold and 8 parts of alloy. Gold is not considered in China as money, but as merchandize, and it is sold at a certain price in silver by the weight of 10 tales.

Although silver be often used in China as a numeral value, it is never fashioned into perfect money; the practice being confined to separating pieces of bullion, and of different sizes, from  $\frac{1}{2}$  tale to 100 tales, the intrinsic value of which is determined by their weight and fineness.

If silver in bars be inferior to 80 touch, it is not admitted in commerce.

Spanish dollars are reputed to be of 90 touch; the silver currency of France 93, and that of England 94.

100 tales should weigh  $120\frac{1}{2}$  ounces troy-weight, each of which is equivalent to 8 maces 2 candarines  $7\frac{1}{2}$  cash.

The pecul consists of 100 catties, and the catty, which is 16 tales, corresponds with 1 pound 3 ounces 12 drams avoirdupois.

All sorts of provisions, as milk, fowls, hogs, greens, &c., are sold by the catty.

25 cantas of sooloo are 1 pecul of rice of 100 catties.

A covid consists of 10 punts, and is  $14\frac{1}{2}$  inches of England.

16 covids = 39 feet or 3 yards English.

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#### CARARA.

In this town of Tuscany, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari currency.

Marble is measured per palmo of 12 oncie, 15 of which are equal to the English foot.

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#### CASSEL.

In this city, and in the landgravate of Hesse, accounts are kept in thalers, each thaler consisting of 32 albus, and each albus of 9 pfenings, or 12 Hessian hellers.



The current thaler is  $1\frac{1}{2}$  reichs gulden, 24 gute groschen, 32 albus of Hesse, 36 marien groschen, 90 kreitzers, 288 pfenings, or 384 hellers.

The effective reichsthaller is  $1\frac{1}{3}$  thaler, or 2 reichs gulden.

These monies are reduced as follows :

|                           |                          |
|---------------------------|--------------------------|
| 3 effective reichsthalers | make 4 current thalers   |
| 2 current thalers         | ..... 3 reichs gulden    |
| 4 albus of Hesse          | ..... 3 gute groschen    |
| 8 albus of Hesse          | ..... 9 marien groschen. |

The currency of Hesse chiefly consists of pieces of 8, 4, 2, 1 gute groschen, of  $2\frac{1}{3}$  albus, of 4 hellers, and 3 pfenings.

The cleuder, for weighing wool, is composed of 21 pounds.

A viertel of corn measures 4 himtens, 16 moetsens, or 64 moesgens.

The fuder contains 6 ohms, 120 viertels or quarteleins, and 480 maas.

#### CLEVES.

Accounts are kept at Cleves, Juliers, and generally in the circle of Lower Westphalia, in current reichsthalers of 60 stivers, each stiver consisting of 16 hellers, or 8 pfenings, currency of Cleves.

The reichsthaller is 2 thalers of Cleves, or  $1\frac{1}{2}$  reichs gulden, each of the latter being 2 gulden of Cleves.

The thaler of Cleves is  $1\frac{1}{2}$  gulden of Cleves, or 4 schillings ; and the Cleves gulden is  $2\frac{2}{3}$  schillings, 8 gute groschen, 20 stivers, 30 kreitzers, 40 foetmengers, 80 frische, 160 pfenings, or 320 hellers.

|                  |                           |
|------------------|---------------------------|
| 2 reichsthalers  | .... make 3 reichs gulden |
| 3 reichs gulden  | ..... 4 Cleves thalers    |
| 2 Cleves thalers | ..... 3 Cleves gulden     |
| 3 Cleves gulden  | ..... 8 schillings.       |

The coins of Prussia are current at Cleves.

The last consists of 15 malters, or 60 scheffels, and the scheffel of 4 viertels, or 48 kanne.

#### COBLENTZ.

Accounts are kept in thalers of 54 petermoengers current.

A current thaler is  $1\frac{1}{2}$  reichs gulden ; and the reichs gulden is 12 great petermoengers, and 36 little petermoengers.



The other monies, as well as the weights and measures, are the same as those of Cologne.

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COLOGNE.

Accounts are kept either in effective thalers, or rixdollars, of 80 current albus, or in current rixdollars of 78 albus current, the albus being divided into 12 hellers.

The effective rixdollar is also  $1\frac{1}{4}$  ræder-gulden,  $1\frac{1}{2}$  effective gulden, 2 herren guldens,  $3\frac{1}{3}$  guldens of Cologne, 4 orts, 8 shillings, 20 blafferts, or 80 albus current.

The blaffert is  $1\frac{1}{2}$  ræder-albus,  $2\frac{2}{3}$  gœsgens, 3 stivers, 4 albus current,  $4\frac{1}{2}$  kreitzers, 5 light albus, 6 foetmengers, 48 hellers.

|                           |                            |
|---------------------------|----------------------------|
| 39 effective rixdollars   | make 40 current rixdollars |
| 13 ditto.....             | 20 current guldens         |
| 3 ditto.....              | 10 guldens of Cologne      |
| 4 ditto.....              | 5 ræder-gulden             |
| 4 current rixdollars..... | 13 guldens of Cologne      |
| 3 ræder-albus.....        | 8 current albus.           |

The coins of Cologne are as follow :

Of gold : the imperial ducat of 3 effective rixdollars.

Of silver : the effective rixdollar; the effective gulden, or zweydrittelstucke, of  $53\frac{1}{2}$  current albus; the half and the quarter gulden of proportionate value.

Of silver and copper : the stiver of  $1\frac{1}{3}$  albus, or 16 hellers; the foetmenger of 8 hellers; and the current albus of 12 hellers.

The marc, for weighing precious metals, is well known, and used in the greatest part of Germany. It consists of 8 ounces, 16 loths, 64 quintins, 256 pfenings, or 4352 esches.

According to assays made by Mr. Tillet, the marc of Cologne is equivalent to 4403 grains of France; whence it corresponds with  $3612\frac{1}{6}$  grains troy-weight.

The pound, for weighing rough goods, consists of 2 marcs.

The centner, or quintal, of Cologne consists of 106 pounds.

A last of corn is 20 malters.

The ton consists of 160 viertels, or 640 maas.

An ohm of wine contains 26 viertels, 104 maas, or 416 pintges.

Two sorts of ells are used at Cologne, the grosse and the kleine: 19 grosse ells make 23 kleine ells.



## COPENHAGEN.

In this city, and in the greater part of Denmark, accounts are kept in *riskdalers*, or rixdollars, each rixdollar consisting of 6 marcs, and each marc of 16 skillings Danish. In some other parts of this kingdom, the rixdollar is divided either into 4 orts of 12 stivers, or into 48 stivers.

The same rixdollar is  $1\frac{1}{2}$  daler, 6 marcs, 48 stivers, 96 skillings Danish, 192 firkes, 288 wittes, or 1152 pfenings.

The coins of Denmark are as follow :

Of gold : the effective ducat, worth about  $2\frac{1}{2}$  rixdollars, or 15 marcs ; the current ducat of 2 rixdollars, or 12 marcs.

Of silver : the effective rixdollar of  $7\frac{3}{8}$  marcs, or 59 stivers ; the *krohn*, or crown, of 34 stivers, or 68 skillings Danish.

Of silver and copper : the ebrœer, or justus judex, of 7 stivers ; the double ebrœer of 14 stivers ; the kopstyk of 10 stivers ; the riks-ort of 12 stivers ; and the pieces of 15, 10, 8, 4, 2, and 1 skilling Danish.

Of copper : the skilling Danish ; the half and quarter skilling.

The marc, for weighing precious metals, consists of 16 lods, 64 quintins, 128 pfenings, or 256 hellers ; and as it corresponds, according to Mr. Tillet, with  $4438\frac{1}{3}$  grains of France, it is equivalent to  $3641\frac{1}{6}$  grains troy weight.

In the assaying of gold, the marc is divided into 24 carats, each carat into 12 grains ; and in the assaying of silver, into 16 lods, each lod into 18 grains.

A marc of gold of the purity of 21 carats and 2 grains has been coined since 1757 into 85 ducats ; and a marc of silver of the purity of 14 lods, into  $9\frac{1}{4}$  effective rixdollars since 1776.

The pound, for weighing rough goods, consists of 32 lods, 16 of which should be equal, according to the statutes, to 17 of those which compose the marc for weighing gold and silver : Mr. Tillet found, however, that the half pound weighed only  $4702\frac{1}{2}$  grains of France, which correspond with 3858 grains troy weight ; so that the half pound, which ought to be  $6\frac{1}{4}$  heavier than the marc, exceeds its weight in the ratio of 100 to only  $105\frac{5}{8}$ .



The skipund consists of  $3\frac{1}{2}$  centners, 20 lispunds, or 320 pounds.

The centner is 100 pounds, and the lispund 16.

The vaag, or vog, is 3 bismerpunds, or 36 pounds.

The apothecaries make use of the weight of Hamburg.

A last of corn is 12 tœnde, or 96 skiepers.

A tœnde is 8 skiepers, and a skieper, or ottinger, 4 fierdingkar.

The tœnde measures  $4\frac{1}{2}$  cubic feet of Denmark.

The stickfat, liquid measure, is  $7\frac{1}{2}$  ahms, or  $1162\frac{1}{2}$  pottes.

The fuder contains 2 pipes, 4 oxhofts, or 6 ahms; and the ahm is divided into 4 ankers, 40 stubgens,  $77\frac{1}{2}$  kanne, 155 potte, or 620 poele.

A tœnde of beer is 136 pottes, and a tœnde of salt 176.

The *alen*, or ell, of Denmark is divided into 2 feet; and the *fod*, or foot, into 12 inches, or 144 lines.

The Danish fathom, *Danske faon*, is composed of 6 feet.

The tœnde-hart-korn, land measure, is 28000 square ells, and consists of 8 skieper-hart-korn, 16 fierdingkar, 48 album, and 144 penge.

A Danish mile measures 12000 ells.

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#### CORFU.

In this island, the capital of the Republic of the Seven Islands, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari. The lira is also 10 Venetian copper coins, called *gazzette*.

The several other coins of Venice, such as the gold sequin, the silver dollar and ducat, and the imperial rixdollar of the coinage of Maria Theresa, are current at Corfu, as is also the Spanish dollar, though in a less degree. The value, however, of these monies is variable, and particularly of the sequins.

The piastre is 40 paras, or 80 gazzette: there are also coins of 100, 80, 60, 30, 20, 15, 10, and 5 paras.

The piece of 100 paras is called by the Italians, *tallero Turco*, and by the Turks themselves, *kara-grousch*.

The Imperial and Venetian dollars are worth about 24 lire 10 soldi: but in the payment of duties to the government, the latter is not received for more than 24 lire.

The weights are upon the principle of the Venetian weights.



The measure for oil, which is the chief production of the island, is called *zara*, or jar.

A tonnellata of oil is composed of 80 jars, and the barrica of 4.

The dry measure is called *moggio*, and contains about 5 per cent more than 2 staja of Venice.

At Zante, Cephalonia, Santa Maura, Cerigo, Paxi, and Ithaca, which are the other islands of the republic, the Turkish coins are more current than at Corfu.

The currants of Zante, Cephalonia, and Ithaca, which are the chief exportable articles from those islands, are purchased almost wholly by Venetian sequins, at a certain rate per *migliajo*, or 1000 pounds Venetian great weight.

#### COROMANDEL.

On the coast so called, in the East Indies, accounts are kept in pagodas, in rupees, or in fanams.

The effective gold pagoda is reckoned at Portonovo for 12 fanams of gold, at Godelura for 18, at Negapatnam for 24, at Pondicherry and Malipura for 24 fanams of silver, and is generally worth  $3\frac{1}{2}$  rupees.

The rupee of account is always 16 annas.

The anna is a small coin of silver, and the cash is of copper.

The candy consists of 20 maunds,  $32\frac{1}{2}$  talons, 65 taries, 130 tukos,  $162\frac{1}{2}$  vis, 800 seers, 6500 paloins, 65000 pagodas.

The candy is divided by the English into 20 maunds, or 150 vis, which are equivalent to 500 pounds avoirdupois; and by the French into 20 mons, or 160 bis, corresponding with 480 pounds of France.

The Coromandel weight is 2 per cent heavier than that of the coast of Malabar.

Several sorts of measures are used in Coromandel for rice and other descriptions of goods, such as the *garza*, the *mercale*, and the *olka*; but by reason of the difference existing in the application of those measures in various parts of the coast, it would be scarcely practicable to offer distinct explanations of the whole.



## CORSICA.

Accounts, which were formerly kept in this island in lire, soldi, and denari currency of Genoa, are actually kept in francs and cents.

The pound, for weighing rough goods, corresponds with 5315 grains troy weight.

The stajo, dry measure, is 2 mezini, or 12 bazini.

A barril of wine is 2 some, 12 zucchi, 108 pinti, or 432 quarti.

## CURAÇAO.

In this island of South America, and belonging to the Dutch, accounts are kept in pesos, or dollars, each dollar consisting of 8 reals, or shillings, and each shilling of 6 stivers.

The Spanish gold pistole is reckoned for  $4\frac{1}{2}$  dollars, and worth 9 florins and 9 stivers currency of Holland.

The Joanes of Portugal is worth about 11 dollars.

The pound is  $7\frac{1}{2}$  per cent heavier than that of Amsterdam.

The Spanish vara is used at Curaçao, and 81 varas make 100 Dutch ells.

## CYPRUS.

Accounts are kept in this island in mines, each mine consisting of 100 aspers.

The coins in circulation are the same as those of Turkey.

A cantaro is 100 rotolos, and a rotolo consists of 12 ounces, or 750 drachms.

The oka of Cyprus is 400 drachms, and the ounce  $62\frac{1}{2}$ .

The weight at the town of Famagusta is 4 per cent heavier than that of the other parts of the island.

Corn is measured by the medimno; wine by the cuss; and oil is sold per rotolo of  $2\frac{1}{2}$  okas.

## DAMASCUS.

In this city, the capital of Syria, accounts are kept in piastres of 80 aspers.

The other monies are the same as those inserted under the head of Aleppo.



The cantaro consists of 100 rotolos, and the rotolo is composed of 600 pesos, or 400 metecales.

### DANTZIC.

Accounts are kept at Dantzic, the capital of Western Prussia, in *guldens*, or florins, each florin consisting of 30 groschen.

The *thaler*, or rixdollar, consists of 3 florins, 90 groschen, or 270 schillings current money.

The Prussian thaler makes 4 florins, 120 groschen, or 360 schillings of Dantzic.

3 Prussian guldens make 4 florins of Dantzic.

The coins current are as follow :

Of gold : the Dutch ducat, fixed at 12 florins Dantzic currency.

Of silver : the effective reichsthaler, worth about 6 florins.

Of silver and copper : the schostack, or sechser, of 6 groschen ; the dutgen of 3 groschen ; and the groschen of 3 schillings.

Of copper : the shilling.

The marc, for weighing gold and silver, corresponds, according to Mr. Tillet, with 3395 grains of France, which are equivalent to 3605½ grains troy weight. It consists of 8 ounces, 16 loths, 64 quintins, 256 pfenings.

In the assaying of gold, the marc is divided into 24 carats, each carat into 12 grains ; and in the assaying of silver, into 16 loths, each loth into 16 pfenings.

The schipfund is composed of 20 lispfunds, or 330 pounds.

The centner consists of 5 stone, or 110 pounds : the stone is 22 pounds, and the lispfund 16½.

The pound is 2 marcs, 16 ounces, 32 loths, 48 schott, or 512 pfenings.

A last of corn, when purchased by the burghers, measures 60 scheffels, 240 viertels, or 960 metzens ; but the same last, when shipped off, measures only 56½ scheffels Berlin measure.

A last of wine consists of 2 fass, or fuders, 8 oxhofts, 12 ahms ; and the ahm contains 4 ankers, 20 viertels, or 110 stofs.

A last of beer consists of 6 fass, or 1080 stofs.

The hube, land measure, is 30 morgens, or 9000 square ruthes.



The Polish hacken corresponds with 20 morgens, or 6000 square ruthes.

The morgen is 300 square ruthes, the seil 10; the ruthe is  $7\frac{1}{2}$  ells, the fathom 3; and the ell is 2 feet.

N. B. Prussian weights and measures have been introduced at Dantzic, and all public scales have Prussian weights.

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DUBLIN.

Accounts are kept at Dublin, and throughout Ireland, in pounds Irish, each pound consisting of 20 shillings, and each shilling of 12 pence Irish.

The coins of England are to those of Ireland in the proportion of 12 to 13; wherefore

The guinea is worth 22 shillings 9 pence

The crown ..... 5 ditto      5 ditto

The pound sterling .21 ditto      8 ditto

The shilling sterling.....13 ditto.

The weights and measures are the same as those of England.

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DUNKIRK.

Accounts are kept in francs, each franc consisting of 100 cents.

The coins of France are current at Dunkirk, without any difference either in their denomination or in their value.

The pound consists of 14 ounces poids de marc; whence 7 pounds of Paris make 8 pounds of Dunkirk.

The Paris and Flemish ells are used at Dunkirk.

Corn is measured by the raziere, of which there are two sorts, the sea raziere and the land raziere.

8 sea razieres make 9 land razieres.

A lot, liquid measure, is 4 pints, or 16 potées.

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ELSINORE.

Accounts are kept in this city of Denmark either in *riksdalers*, or rixdollars, each rixdollar consisting of 4 orts, and each ort of 12 stivers, or in rixdollars of 48 stivers.



These monies have three different values, denominated specie, crown, and current.

Specie-money is that in which the duties at the Sound were fixed in 1687 and 1701.

Crown-money was the former currency of Denmark, the value of which is now  $6\frac{1}{4}$  per cent more than that of the present coinage.

Current-money is that which is actually circulating in Denmark, and also used in respect to the payment of the duties at the Sound.

The proportion between these denominations is as follows :

Specie-money is  $12\frac{1}{2}$  per cent better than crown-money, and  $19\frac{5}{8}$  per cent better than current-money.

To reduce specie-money into crown-money, add  $\frac{1}{8}$  ; and to reduce crown-money into current-money, add  $\frac{1}{16}$  ; whence 6 stivers are to be added for each specie rixdollar, and 3 stivers for each crown rixdollar, to make them current-money.

128 specie rixdollars make 144 crown rixdollars, or 153 current rixdollars.

8 specie rixdollars make 9 crown rixdollars.

16 crown rixdollars..... 17 current rixdollars.

The effective rixdollar, coined since 1776, and of which I have spoken under the head of Copenhagen, is  $22\frac{1}{4}$  per cent better than the current rixdollar, and  $2\frac{3}{4}$  per cent better than the specie rixdollar, in which the duties are payable.

The weights and measures used at Elsinore are the same as those of Copenhagen.

#### EMBDEN.

Accounts are kept at Embden either in reichsthalers, each consisting of 54 stivers, and each stiver of 10 wittens ; or in gulden, each gulden consisting of 20 stivers, or 200 wittens. The gulden is also divided into 10 schaafs, and the schAAF into 10 wittens.

The specie reichsthaler is 4 marcs, or 72 stivers.

The current reichsthaler is 3 marcs, or 54 stivers.

The thaler, or schlecht thaler, is 30 stivers.

The gulden is divided into other monies as follows :

A gulden is  $1\frac{1}{2}$  marc,  $3\frac{1}{3}$  shillings,  $6\frac{2}{3}$  flinderkes, 10 schaafs, 20 stivers,  $26\frac{2}{3}$  groots, 40 seyferts, 80 oerts, 200 wittens.



3 specie reichsthalers are 4 current reichsthalers  
 5 ditto are 12 thalers, or 18 current guldens  
 5 current reichsthalers are 9 current thalers  
 10 current reichsthalers .. 27 current guldens  
 2 current thalers..... 3 current guldens  
 9 current guldens ..... 10 current marcs.

The coins of Embden are as follow :

Of silver : the zweydrittelstucke of 36 stivers ; the schlecht thaler of 30 stivers ; and the gulden of 20 stivers.

Of silver and copper : the pieces of  $4\frac{1}{2}$ , 3, and  $1\frac{1}{2}$  stiver ; the flinderke of 3 stivers ; the schaaf of 2 stivers ; the seyfert of 5 wittens, the oert of  $2\frac{1}{2}$  wittens ; and the witten.

All the coins of Prussia are current at Embden, without any difference either in their denomination or in their value.

The schippond is 3 centners, or 300 pounds, and each pound is 16 ounces, or 32 loths ; but in some other parts of East Friesland the pound is composed of a greater number of loths.

At Greetzyl, Leer, and Stikhausen, the pound is 34 loths ; at Berum, Dornum, Eezens, Friedeburg, Norden, and Witmunde, it is 36.

A tonne of corn consists of 4 werps, 8 scheffels or scheppels, or 144 kruesses.

15 tonnes, 60 werps, or 120 scheffels, compose the last of Embden, Greetzyl, Leer, and Stikhausen ; but the last at Friedeburg is 13 tonnes, or 52 werps, each of 43 kruesses ; at Witmunde, 14 tonnes, or 56 werps, each of 44 kruesses ; at Berum, Dornum, and Norden, 14 tonnes, or 56 werps, each of 42 kruesses.

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#### ERFURT.

In this city of Upper Saxony, accounts are kept in thalers, each thaler consisting of 24 gute groschen, and each gute groschen of 12 pfenings.

The other coins are the same as those which are current at Leipsic.

A malter of corn is 4 viertels, 12 scheffels, 48 metzens, or 192 mœgens.

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## FLORENCE.

Accounts are kept at Florence, and in the kingdom of Etruria, in several manners, according to the specific value of the following monies :

The scudo d'oro, or gold crown, of  $7\frac{1}{2}$  lire, is divided into 20 soldi d'oro, and the soldo d'oro into  $4\frac{1}{2}$  crazie, or 12 denari d'oro.

The ducato, ducatone, scudo corrente, or piastra of 7 lire, is divided into 20 soldi di ducato, 84 crazie, or 240 denari di ducato.

The pezza da otto reali, or livornina of  $5\frac{3}{4}$  lire, is divided into 20 soldi di pezza, 69 crazie, or 240 denari di pezza.

The testone, or doppia lira, is 2 lire, 3 paoli, or giuli, 24 crazie, 40 soldi di lira, 120 quatrini, or 480 denari di lira.

The soldo d'oro is  $1\frac{1}{14}$  soldo di ducato,  $1\frac{7}{23}$  soldo di pezza, or  $7\frac{1}{2}$  soldi di pezza.

14 scudi d'oro are 15 ducati

23 ditto ..... 30 pezze da otto reali

23 ducati ..... 28 ditto.

The Florentine money, denominated *moneta buona*, is  $4\frac{8}{35}$  per cent better than the money of Leghorn, called *moneta lunga*; wherefore

23 lire *moneta buona* are 24 lire *moneta lunga*.

The coins of Etruria are as follow :

Of gold : the ruopono, or rupono, of 40 lire; the doppia of 23 lire; the half doppia of  $11\frac{1}{2}$  lire; and the zecchino gigliato of  $13\frac{1}{3}$  lire, or 160 crazie.

Of silver : the francescono of 2 francescini, worth  $6\frac{2}{3}$  lire, or 10 paoli; the ducato, or piastra, of 7 lire, exclusive of an agio of 6 per cent, more or less; the tallari, or lanternina della torre, of 6 lire, exclusive of an agio of 4 per cent; the pezza della rosa, or livornina, of  $5\frac{3}{4}$  lire, exclusive of an agio of 3 per cent.

Of silver and copper : the doppia piastrina of 34 crazie and 2 quatrini; the piastrina of 17 crazie and 1 quatrino; the testone of 3 paoli, or 24 crazie; the cavaletto of 2 paoli, or 16 crazie; the lira of  $1\frac{1}{2}$  paolo, or 12 crazie; the paolo, or giulo, of 8 crazie; the crazie of 5 quatrini; the soldo of 2 quatrini; and the quatrino of 4 denari.



The pound, for weighing gold and silver, corresponds, according to Mr. Tillet, with 6392 grains of France, which are equivalent to 5244 grains troy weight.

The pound, for weighing rough goods, being 3 per cent heavier, is therefore 5401 $\frac{3}{4}$  grains troy weight.

Each pound is divided into 12 onzie, or ounces, the ounce into 24 denari, and the denaro into 24 grani; whence the pound is 6912 grains of Florence.

A moggio of wheat consists of 8 sacchi, or 24 staji; each stajo weighs about 50 pounds: but a stajo of salt weighs 72 pounds of Florence.

The cogna, liquid measure, contains 10 barrili, 20 fiaschi, 400 boccali, or 1600 quartuci.

An orcio of oil is composed of 32 boccali, or metadeli.

A cana is 4 bracci, or 8 palmi; there are two measures of that denomination.

The soccata, land measure, consists of 10 stajole, or 660 pertiche, each perticha of 5 bracci.

#### FRANCE.

##### *Late System.*

Accounts were kept in France in livres tournois, each livre consisting of 20 sols, or sous, and each sol, or sou, of 12 deniers.

The crown of exchange was 3 livres, or 60 sols tournois.

The coins of France were as follow:

Of gold: the double louis of 48 livres; the louis of 24 livres; and the half louis of 12 livres.

Of silver: the crown, or écu, of 6 livres; the petit écu of 3 livres; and pieces of 24, 12, and 6 sols.

Of silver and copper: pieces of 2 sols, and of 6 liards.

Of copper: the sol of 4 liards; the half sol; and the liard of 3 deniers.

The coinage of gold and silver was regulated as follows:

A marc of gold of the purity of 22 carats, inclusive of 15 grains for the remedy of the weight, and of  $\frac{1}{32}$  of a carat for the remedy of the alloy, was coined, after the year 1726, into 30 louis of 24 livres each; but the same marc, inclusive of similar remedies, was coined, after the year 1785, into 32 louis of 24 livres.



A marc of silver of the purity of 11 deniers, inclusive of 36 grains for the remedy of the weight, and of  $\frac{1}{8}$  of a denier for the remedy of the alloy, was coined, after the year 1726, into  $8\frac{3}{10}$  écus, and the other coins in the same proportion.

The marc for weighing gold and silver consisted of 8 ounces, 64 gros, 192 deniers, or 4608 grains.

In the assaying of gold, the marc was divided into 24 carats, or 768 grains; and in the assaying of silver, into 12 deniers, or 288 grains.

The ounce, for weighing diamonds and pearls, was composed of 144 carats, or 576 grains.

The apothecaries made use of a pound which they divided into 2 marcs, 12 ounces, 96 drachms, 288 scruples, or 6912 grains.

The pound, poids de marc, consisted of 2 marcs, 16 ounces, 128 gros, or 9216 grains.

The *tonneau de mer* was 2000 pounds, and the quintal 100.

As the measures used in the principal cities in France differed from each other, they are described in this work under the heads of Bayonne, Bordeaux, Dunkirk, Lisle, Lyons, Marseilles, Montpellier, Nantes, Paris, Rochelle, Rouen, St. Malo, Strasburg, and Toulon.

The *lieue de poste* was 2000 toises; the *lieue terrestre* 2288,33; the *lieue marine* 2850,41; and the *lieue moyenne* 2565,37.

The toise was 6 pieds, and the pied, generally denominated *pied de roi*, 12 pouces, or 144 lignes.

The aune of France was 44 pouces, or 528 lignes.

The arpent *des eaux et forêts* was 100 perches, 1344 $\frac{1}{2}$  toises carrés, or 48400 pieds carrés; and the perch of 22 pieds was 484 pieds carrés.

#### Present System.

Accounts are kept in francs, each franc consisting of 100 centimes.

The coins of France are as follow:

Of gold: pieces of 40 and 20 francs each.

Of silver: pieces of 5, 2, and 1 franc; of  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  franc.

Of copper: pieces of 2 and 1 decime; of 5, 3, 2, and 1 centime.

The coinage of gold and silver is regulated as follows:

It was enacted by a law of the 28 Thermidor, 3d year (August 15, 1795), that the franc, or money-unit of France, should be



divided into 10 equal parts, called *decimes*, and each tenth into 10 hundredths, called *centimes*; that pieces of silver should be coined of one, two, and of five francs, containing 5 grammes, or at the rate of 5 grammes, for each franc, of which 9 parts to be of pure metal and 1 part of alloy; that the tolerated standard should not exceed the prescribed standard by more than 7 milliemes, or be more than 7 milliemes under the same standard; and that the tolerated weight should not be more than  $\frac{1}{200}$  above, or less than  $\frac{1}{200}$  under, the weight prescribed.

The only pieces which have been coined in pursuance of the law referred to are those of 5 francs. The maximum of the weight of each is 25,125 grammes, and its minimum 24,875. The maximum of the standard of each is 907 milliemes, and its minimum 893. A piece of 5 francs, of reputed mean weight and standard, would contain, therefore, 25 grammes of silver of the purity of 900 milliemes, or 22 grammes 5 decigrammes of fine silver.

By a subsequent law of the 25 Germinal, 4th year, it was enacted that the pieces of 5 francs, of the coinage of the Republic, should be received for 5 livres 1 sol 3 deniers tournois; whence the numeral equivalence of the livre and of the franc, which had till then subsisted, was necessarily destroyed, and the value of the franc in respect to the livre was established in the proportion of 80 to 81.

It may not be uninteresting to examine whether or not such relation be correct.

We have already seen that the piece of 5 francs contains 22 grammes 5 decigrammes of fine silver; whence it follows that the franc contains 4 grammes 5 decigrammes of pure metal.

Now, supposing that the remedy of the weight had been used so as to reduce the marc of silver to 4578 grains, and that its standard were also reduced, by means of its relative allowance, to 10 deniers  $21\frac{1}{2}$  grains, it follows that the same marc would contain 4156,76 grains of fine silver, which, if coined into  $8\frac{3}{10}$  crowns, would constitute the weight of the crown at 500,81 grains, being equivalent to 26 grammes 6 decigrammes. Hence the livre tournois, considered as the sixth part of the crown, would contain 4 grammes  $4\frac{1}{3}$  decigrammes.

By comparing, therefore, the quantity of fine silver in a franc with what should be contained in a livre tournois, if there were any coin of that specific denomination, it would be found that the



piece of 5 francs would be of the value, intrinsically, of 5 livres 1 sol 6 deniers, or 101 sols 6 deniers, according to the following proportion :

4,4 $\frac{1}{3}$  value of a livre : 4,5 value of a franc :: 100 sols : 101,50.

Thus the proportion of the franc to the livre, established by law, was less than the actual proportion ; and it was perhaps introduced upon a supposition that the farmers of the mints did not avail themselves of the remedy of the mint and of the remedy of the law to the extent abovementioned.

By a decree which passed the Legislative Body on the 9th of Germinal, 11th year (30th March, 1803), and which is the last upon the subject, the new gold coinage was appointed to be of 40 and 20 franc pieces ; the silver to be of the division already mentioned.

The gold and silver coins are of nine-tenths pure metal and one-tenth alloy.

The effective weight of these monies is as follows :

|                               |               |
|-------------------------------|---------------|
| The gold 40 franc piece.....  | 12,90 grammes |
| The gold 20 franc piece.....  | 6,45 ditto    |
| The silver 5 franc piece..... | 25 .. ditto.  |

The kilogramme of fine gold is received in the several mints in exchange for 3434 francs 44 cents, and the kilogramme of fine silver for 218 francs 88 cents : whence the proportion between gold and silver is very nearly as 1 to 15 $\frac{1}{4}$ .

The weights and measures enacted to be established by the decree of the National Convention of the 18 Germinal, 3d year (7th April, 1795), are founded upon an invariable basis, being that of a tenth part of the distance from the pole to the equator ; that is, a tenth part of a quadrant of the terrestrial meridian, which is equivalent to 513,074 fathoms, or 3,078,444 feet of France. The measure, therefore, which has thus been adopted as the universal standard, is that of the millionth part of the same distance, which, according to the antient mensuration, corresponds with 36 inches 11 lines 296 thousandths of a line ; and the denomination given to this new unit is that of *metre*.

The metre is the elementary measure of every other measure.

The metre, considered longitudinally, is the element of every rectilineal measure.

The square metre is the element of superficial measure.

The cubic metre is the element of the measures of capacity.



A cubic metre of water condensed from vapour, weighed *in vacuo*, and by this means reduced to its greatest density, weighs 2042 pounds 14 ounces 14 grains of France; and it is the millionth part of the weight of the same cubic metre which has been taken as the basis of every other measure, and is called *gramme*.

By the word *gramme* is therefore meant the weight of a cubic centimetre of water.

The new weights and measures are denoted by four elementary words, or by words expressive of the characteristic of each of such elementary words, and, at the same time, of the decimal subdivision or decimal collection of the quantities referred to.

The elementary words are, *metre*, *are*, *litre*, and *gramme*.

The composite words are formed by prefixing *deci*, *centi*, and *milli*, in respect to decimal subdivision, and by prefixing *deca*, *hecto*, *kilo*, and *myria*, in respect to decimal collection. The three former are to be considered as divisors, and the four latter as multiples, all applicable to each elementary weight, and to each elementary measure; an essential and useful property of this mode of computation, being that of preserving the generical word, in the expression of all the modifications of quantity.

It will be observed, that the word *deci* means a tenth of the thing spoken of; *centi* an hundredth; and *milli* a thousandth.

In like manner, the words *deca*, *hecto*, *kilo*, and *myria*, mean, respectively, ten times, a hundred times, a thousand times, and ten thousand times, the thing spoken of.

The *myriagramme*, in respect to weights, is 10 kilogrammes, 100 hectogrammes, 1000 decagrammes, 10000 grammes; and the *gramme*, or the unit of weights, is 10 decigrammes, 100 centigrammes, 1000 milligrammes.

The *myrialitre*, in respect to measures of capacity, is 10 kilolitres, 100 hectolitres, 1000 decalitres, 10000 litres; and the *litre* is 10 decilitres, 100 centilitres, 1000 millilitres. The *litre* is the unit of measures of capacity, and its capacity is equal to that of a cubic decimetre.

The *myriametre*, in respect to measures of length, is 10 kilometres, 100 hectometres, 1000 decametres, 10000 metres; and the *metre*, or unit of those measures, is 10 decimetres, 100 centimetres, or 1000 millimetres.

The *myriare*, in respect to superficial measure, is 10 kiloares,



100 hectares, 1000 décares, 10000 ares; and the are, or unit of those measures, is 10 déciars, 100 centiares, 1000 milliares. The centiare is a square metre.

*Relation of the late and present Weights and Measures.*

|                                     |        |                   |
|-------------------------------------|--------|-------------------|
| The tonneau de mer is               | 97,90  | myriagrammes      |
| The quintal                         | 48,95  | kilogrammes       |
| The pound                           | 489,50 | grammes           |
| The muid of Paris                   | 2,742  | hectolitres       |
| The pinte ditto                     | 0,952  | litre             |
| The boisseau ditto                  | 1,269  | décalitre         |
| The litron ditto                    | 0,793  | litre             |
| The lieue terrestre                 | 0,444  | myriametre        |
| The lieue marine                    | 0,556  | ditto             |
| The lieue moyenne                   | 0,5    | ditto             |
| The toise                           | 1,949  | metre             |
| The pied de roi                     | 3,248  | decimètres        |
| The pouce ditto                     | 2,706  | centimètres       |
| The ligne ditto                     | 2,256  | millimètres       |
| The aune of 528 lignes              | 1,191  | metre             |
| The aune of 526 $\frac{5}{8}$ ditto | 1,188  | ditto             |
| The aune of 524 ditto               | 1,182  | ditto             |
| The arpent of France                | 0,51   | hectare           |
| The arpent of Paris                 | 0,342  | ditto             |
| The myriagramme is                  | 0,2043 | quintal           |
| The kilogramme                      | 2,043  | livres            |
| The gramme                          | 18,827 | grains            |
| The hectolitre                      | 0,365  | muid of Paris     |
| The litre                           | 1,05   | pinte ditto       |
| The decalitre                       | 0,788  | boisseau ditto    |
| The litre                           | 1,26   | litron ditto      |
| The myriametre is                   | 2,25   | lieues terrestres |
|                                     | 1,8    | lieue marine      |
|                                     | 2      | lieues moyennes.  |

The metre is 443,296 lignes; 36,941333 pouces; 3,078444 pieds; 0,513 toise; 0,839 aune of 528 lignes; 0,841 aune of 526 $\frac{5}{8}$  lignes; 0,846 aune of 524 lignes.

The hectare is 1,958 arpent of France; 2,925 arpens of Paris.

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FRANKFORT ON THE MAINE.

Accounts are kept at Frankfort, Darmstad, Hanau, and Mentz, in thalers, each thaler consisting of 90 kreutzers, and each kreutzer of 4 pfenings; or otherwise in guldens of 60 kreutzers, or 240 pfenings.



The specie reichsthaler is  $1\frac{1}{3}$  current thaler, 2 guldens, 6 kopfstucke, 30 batzen, 40 kaysergroschen, 60 albus, 120 kreutzers, 480 pfenings.

|                             |                    |
|-----------------------------|--------------------|
| 3 specie reichsthalers make | 4 current thalers  |
| 2 current thalers .....     | 3 guldens          |
| 3 batzen .....              | 4 kaiser groschen. |

The coins of Frankfort are as follow :

Of gold : the ducat of 2 thalers and 70 current kreutzers.

Of silver : the reichsthaler especie de constitution of 2 guldens 13 kreutzers ; the reichsthaler especie de convention of 2 guldens ; the gulden of 60 kreutzers ; the half and quarter gulden of proportionate value.

Of silver and copper : the kopfstucke of 20 kreutzers ; the pieces of 10 and 5 kreutzers ; the kreutzer of 4 hellers.

Since the year 1765, the only currency at Frankfort in which bills of exchange have been paid is that called *convention money*.

The marc of Cologne is used at Frankfort for weighing precious metals.

A centner is composed of 100 pounds, and a stein of 22.

The pound consists of 2 marcs, 16 loths, 128 quintins, 512 pfenings, or 1024 hellers.

A malter or achtel of corn measures 4 simmers, 8 metzes, 16 sechsterns, or 64 gescheids.

A stuck of wine contains  $1\frac{1}{4}$  fuder,  $7\frac{1}{2}$  ohms, 150 viertels, 600 maas, or 2400 schoppen.

Three ells are used at Frankfort ; the ell of Paris for measuring French goods ; the Flemish ell for those of Holland ; and the ell of Frankfort for those of Germany.

5 ells of Paris make 11 ells of Frankfort, 41 of which are equal to 32 of Brabant.

The foot of Frankfort is equal to that of Hamburg.

#### GALICIA.

In this province of Spain, accounts are kept in reals of vellon, each real consisting of 34 maravedis.

All the other Spanish coins are current without any distinction.

The pound, which is denominated *libra Gallega*, consists of 20 ounces of Castille ; wherefore

4 pounds of Galicia make 5 pounds of Castille.



The quintal of 4 arrobas, or 100 pounds of Galicia, is 125 pounds of Castille.

The fanega, dry measure of Galicia, is 4 ferrados.

The ferrado of Neda, a small village near Ferrol, is generally used in Galicia: it is  $\frac{1}{3}$  of the fanega of Castille; wherefore

100 fanegas of Castille make 300 ferrados of Neda.

The ferrado of Neda and Ferrol is 12 per cent greater than that of Corunna.

100 ferrados of Ferrol make 112 ferrados of Corunna.

A moyo of wine contains 4 canadas, 16 ollas, 68 azumbres, or 272 quartillos, each quartillo weighing 20 ounces of wine.

100 quartillos of Castille make 85 quartillos of Galicia.

The vara and the foot of Castille are used in Galicia; but at Ferrol the vara is 2 per cent less.

#### GALLIPOLI.

In this sea-port of the kingdom of Naples, accounts are kept in ducati, each ducato consisting of 100 grani.

All the coins of Naples are current at Gallipoli.

A salma of oil is composed of 100 staje, or 320 pignatti. A pipe of oil measures  $2\frac{1}{2}$  salme, and 11 salme are reckoned a last in respect to affreightment.

#### GENEVA.

Accounts are kept at Geneva in current livres, each livre consisting of 20 sols, and each sol of 12 deniers current; or otherwise in florins, each florin consisting of 12 sols, and each sol of 4 quarts, or 12 deniers.

The ecu, or crown current, is 3 livres,  $10\frac{1}{2}$  florins, 60 sols, 126 sols of a florin, 504 quarts, 720 deniers, or 1512 deniers of a florin.

2 current ecus make 21 florins

2 ditto livres..... 7 florins

10 ditto sols ..... 21 sols of a florin

10 ditto deniers .... 21 deniers ditto.

The coins of Geneva are as follow:

Of gold: the old pistole of 11 livres 10 sols, or 40 florins 3 sols: the new pistole, coined since the year 1752,



weighing 106 grains of the purity of 22 carats, and worth 10 livres, or 35 florins.

Of silver: the bajoir of 3 livres 15 sols, or  $13\frac{1}{8}$  florins; the ecu, or patagon, of 3 livres, or  $10\frac{1}{2}$  florins.

Of silver and copper: the pieces of 10 and 5 sols; of 21, and  $10\frac{1}{2}$  sols of a florin.

The marc, for weighing precious metals, consists of 8 ounces, 64 gros, 192 deniers, or 4608 grains. It corresponds with 4617 grains of France, and is therefore equivalent to  $3787\frac{3}{4}$  grains troy weight.

In the assaying of gold, the ounce is divided into 24 carats, and the carat into 24 or 32 parts.

In the assaying of silver, the marc consists of 12 deniers, and the denier of 24 grains.

The pound, *poids fort*, for weighing gross articles, is 18 ounces, or 432 deniers.

The pound, *poids foible*, for weighing silk, and some other valuable articles, is 15 ounces, or 360 deniers.

5 pounds *poids fort* make 6 pounds *poids foible*.

A coupe of wheat weighs about 110 pounds *poids fort*.

A char of wine is composed of 12 setiers, or 576 pots; and the setier is divided into 24 quarterons, or 48 pots.

The ell of France is used as well as the ell of Geneva.

100 ells of France make 104 ells of Geneva.

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#### GENOA.

Accounts are kept at Genoa in lire fuori di banco, each lira consisting of 20 soldi, and each soldo of 12 denari di lira.

The scudo d'oro is 20 soldi, or 240 denari d'oro.

The scudo d'oro marche is 20 soldi, or 240 denari d'oro marche.

The difference between those scudi is about 1 per cent; for

5814 scudi d'oro make 5875 scudi d'oro marche.

The scudo d'argento is 20 soldi, or 240 denari d'argento, and worth 7 lire 12 soldi banco, 4 lire 10 soldi moneta di cartulario or di numerato, or 7 lire 4 soldi moneta di paghe.

Bank money is 15 per cent better than current money; wherefore

100 lire banco make 115 lire fuori di banco.



100 scudi d'oro are equal to  $122\frac{2}{3}$  scudi d'argento; whence a scudo d'oro is 9 lire 6 soldi  $0\frac{12}{125}$  denaro banco, or 10 lire 13 soldi  $11\frac{2}{3}$  denari fuori di banco; but in order to avoid this large fraction, the scudo d'oro is reckoned 10 lire 14 soldi fuori di banco.

The piastra, or pezza, consists of 20 soldi, or 240 denari di pezza, and is worth 5 lire banco, or  $5\frac{3}{4}$  lire fuori di banco.

The scudo di cambio is 20 soldi, or 240 denari di cambio, and worth 4 lire banco, or  $4\frac{3}{5}$  lire fuori di banco.

Since the suppression of the Bank of St. George in 1746, banco money has also been denominated *moneta di permesso*; and as the *moneta di permesso* is 15 per cent higher in value than the *moneta fuori di banco*, in which accounts are kept, it is necessary, in drawing upon Genoa, to insert the words *fuori di banco* in the body of the bill, which would otherwise be paid in *moneta di permesso*.

The value of the coins of Genoa in *moneta fuori di banco* is as follows:

Of gold: the doppia of 23 lire 12 soldi; the scudo d'oro of 11 lire 16 soldi; the zecchino of 13 lire 10 soldi.

Of silver: the scudo d'argento, or *Genovina*, of 9 lire 10 soldi, and only of 9 lire when under the weight of  $32\frac{1}{8}$  denari; the scudo di cambio, or *St. Gianbatista*, of 5 lire; the Giorgino of 1 lira 6 soldi.

Of silver and copper: pieces of 10, 8, and 5 soldi banco; or  $12\frac{1}{2}$ ,  $9\frac{1}{2}$ , and  $6\frac{1}{4}$  soldi fuori di banco; the Madonina of 20 soldi; the double Madonina of 40 soldi; the cabaletto of  $6\frac{2}{3}$  soldi.

The pound, *peso sottile*, for weighing precious metals, weighs, according to Mr. Tillet, 5970 grains of France, which are equivalent to  $4897\frac{2}{3}$  grains troy weight. It consists of 12 oncie, the oncia of 24 denari, and the denaro of 24 grani; whence the pound is 6912 grains.

In the assaying of gold, the pound is divided into 24 carati, the carato into 8 ottavi; and in the assaying of silver, into 12 oncie, the oncia into 24 denari.

Gold in bars is sold at the rate of 1312 lire 2 soldi fuori di banco per pound fine, exclusive of an agio either above or below that price.

Silver in bars is sold at the rate of 84 lire 8 soldi fuori di banco per pound fine, exclusive of an agio either above or below that price.



Spanish dollars are sold for a certain number of lire fuori di banco per ounce weight.

Previously to the extension of the revolution in France to the Republic of Genoa, gold was sold in lire di permesso, silver in lire moneta di cartulario, and Spanish dollars in lire moneta di paghe.

The weight and standard of the coins of Genoa are as follow :

|                     |                | Weight.                | Standard.                 |
|---------------------|----------------|------------------------|---------------------------|
| The doppia is       | ..... 6 denari | 2 $\frac{3}{4}$ grains | ..21 $\frac{3}{4}$ carats |
| The zecchino        | ..... 3 ditto  | 4 ditto                | ..23 $\frac{1}{8}$ ditto  |
| The scudo d'argento | ..34 ditto     | 21 $\frac{5}{8}$ ditto | ..11 oncie 12 denari      |
| The scudo di cambio | ..18 ditto     | 22 ditto               | ..11 ditto 1 ditto        |
| The Giorgino        | ..... 5 ditto  | 8 $\frac{1}{2}$ ditto  | ..10 ditto 8 ditto.       |

The pound, *peso grosso*, for weighing rough goods, weighs, according to Mr. Tillet, 5981 grains of France, which correspond with 4906 $\frac{2}{3}$  grains troy weight. It is divided in the same manner as the pound *peso sottile*, than which it is but little heavier.

The cantaro is 100 rotolos, or 150 pounds *peso grosso*.

The rubbo is 25 pounds, and the rotolo 1 $\frac{1}{2}$ .

There are three other weights used at Genoa.

The pound, for weighing raw silk by the public scale, which is 6 $\frac{1}{4}$  per cent heavier than the pound *peso grosso*.

The cantaro of 100 rotolos, used at the custom-house.

The rotolo, *peso di cassa*, for weighing Spanish dollars and other coins, which is 10 per cent less than the custom-house rotolo.

A mina of corn measures 8 quartere, or 96 gombette.

A mondino of salt corresponds with 8 mine of wheat.

A mezzarola of wine contains 2 barrili, or 100 pinti.

A barrile of oil is 2 mezzi-barrili, or 7 $\frac{1}{2}$  rubbi.

Several measures are used at Genoa for cloths, silk stuffs, and linen: the canna grossa of 10 $\frac{1}{2}$  palmi; the canna of 10 palmi; the canna piccola of 9 palmi; the braccio of 2 $\frac{1}{2}$  palmi.

#### GOA.

Accounts are kept at Goa in pardos of 240 reis.

The pardo is also divided into 4 boms tangas, 5 malos tangas, 16 boms vintems, 20 malos vintems, 300 boms bazarucos, and 360 malos bazarucos.



The coins of Goa are as follow :

Of gold : the St. Thomas, worth about 11 boms tangas, and weighing  $53\frac{1}{2}$  grains troy weight, of the purity of 18 carats.

Of silver : the pardo-serafin of 5 boms tangas, or 300 reis ; the pardo of 4 boms tangas, or 240 reis.

Independently of the weights of Portugal, they make use at Goa of the following Indian weights :

The maund, which corresponds with 12 pounds of Portugal, and serves for weighing oil and butter.

The bahar, which is  $3\frac{1}{2}$  quintals of Portugal, and serves for weighing pepper and grocery.

The candy, which corresponds with 495 pounds avoirdupois, consists of 20 maunds, and the maund of 24 medidas, which are employed for measuring corn and rice : rice is also sold by the fardo, weighing  $3\frac{1}{2}$  maunds.

The vara and the covado of Goa are equal to those of Portugal.

#### GOMBROON.

In this city of Asia, situate in a bay of the Streight of Ormus, accounts are kept in mamudis of 20 gasas.

The toman is 20 current mamudis, and the new basi, or ab-basi, 2.

The other coins are referred to under the head of Persia.

Two sorts of maund are used at Gombroon :

The heavy maund for weighing provisions, and the little maund for weighing rough goods.

Cloth is measured by the gueze, 93 of which make 100 yards.

#### GUINEA.

On the coast so called, and in several other parts of Africa, the inhabitants, instead of coins, make use of small shells, called by the Europeans *cowries*, or *cauris*, and by the Africans *zimbis*, 2000 of which make 1 macuta.

Gold dust is generally sold to foreign traders by the akey, which corresponds with  $20\frac{1}{2}$  grains troy weight.

The benda, or weight used by the negroes, corresponds with  $989\frac{1}{2}$  grains troy weight, and is composed of 2 benda-offas, 3 eg-gebas, 8 pisos or eusanos.



The seron is  $1\frac{1}{2}$  piso; and the piso is divided into  $1\frac{1}{3}$  quintos, 2 agiraques, or 4 media-tablas.

Linen is measured by the jactam.

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HAMBURG.

Accounts are kept at Hamburg in marcs, each marc consisting of 16 shillings, and each shilling of 12 pfenings lub.

The *reichsthaler*, or rixdollar, is 3 marcs, 48 shillings, or 576 pfenings.

The thaler is 2 marcs, 32 shillings, or 384 pfenings.

The *pfund Flemish*, or pound Flemish, is 20 shillings Flemish, or 240 grotes Flemish.

A pound Flemish is  $2\frac{1}{2}$  rixdollars,  $3\frac{3}{4}$  thalers,  $7\frac{1}{2}$  marcs, 20 shillings Flemish, 120 shillings lub, 240 grotes Flemish, 720 dreylings, or 1440 pfenings lub.

4 pounds Flemish make 10 rixdollars, or 30 marcs

2 rixdollars..... 3 thalers, or 6 marcs

8 shillings Flemish.... 3 marcs, or 48 shillings lub.

These monies are distinguished by the appellation of bank money and current money.

Bank money formerly consisted of the old specie rixdollars of Germany, which obtained 1 per thousand upon the bank rixdollars; that is, those who deposited 1000 specie rixdollars were credited by 1001 bank rixdollars.

The funds of the Bank consist not, as formerly, of specie, but of ingots of silver, which are required to be of the purity of 15 loths 12 grains, or  $\frac{47}{48}$  fine. Those who deposit such ingots, are credited by the amount, in the books of the Bank, at the rate of 27 marcs 10 shillings banco for each marc of the same silver, the whole of which will be re-delivered on demand, without any reference to the time which may have elapsed since the date of the deposit, upon payment of 27 marcs 12 shillings banco for each marc of the weight registered; which is 2 shillings per marc more than the sum advanced, the value of the difference being applied to the purpose of defraying the charges at the Bank.

The intrinsic value of bank money is  $23\frac{1}{3}$  per cent better than current money, which is composed of the effective coins of Hamburg; but the difference or agio between bank money and current money varies according to circumstances.



Light money, or *leichter-geld*, consists of foreign coins, the value of which is subject to variations.

The coins of Hamburg are as follow :

Of gold : the portugalcæse of 10 ducats ; the half and the quarter portugalcæse, each of proportionate value ; the ducat, worth about 6 marcs banco.

Of silver : the old specie rixdollar, worth about 3 marcs 11 shillings lubs ; the thaler of 2 marcs lubs ; the marc of 16 shillings lubs.

Of silver and copper : pieces of 8, 4, 2, 1,  $\frac{1}{2}$ ,  $\frac{1}{4}$ , shillings lubs.

A marc of gold, of the purity of 23 carats 8 grains, is coined into 67 ducats.

A marc of fine silver is coined into 17 thalers, or 34 marcs ; and a marc of silver, of the purity of 12 loths, is coined into  $12\frac{1}{2}$  thalers, or  $25\frac{1}{2}$  marcs.

The marc, for weighing precious metals, consists of 8 ounces, 16 loths, 64 quintins, 256 pfenings, or 4352 eschen.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains ; and in the assaying of silver, into 16 loths, the loth into 18 grains.

Diamonds and pearls are weighed by carats of 5 grains each.

The carat is also divided into 4, 8, 16, 32, and 64 parts.

71 carats weigh 1 loth of Hamburg, which corresponds with  $225\frac{1}{2}$  grains troy weight ; wherefore the carat used at London is somewhat heavier than that of Hamburg.

100 carats of London make  $100\frac{1}{2}$  carats of Hamburg.

Apothecaries make use of a weight common to Germany in general, which they divide into 12 ounces, 96 drachms, 288 scruples, or 5760 grains.

The pound, commercial weight, consists of 16 ounces, 32 loths, 128 quintins, or 512 pfenings.

The schipfund is  $2\frac{1}{2}$  centners, 20 lispfunds, or 280 pounds.

The centner is 112 pounds, and the lispfund 14.

The schipfund, used in respect to the carriage of goods, is composed of 20 lispfunds, or 320 pounds ; and the lispfund of 16 pounds.

The schipfund, for weighing wool and feathers, is 28 steins, or 280 pounds ; and the stein, or stone, 10 pounds.

The schipfund, for weighing flax, is 14 steins, or 280 pounds ; and the stein 20 pounds.



A last of wheat, rye, and pease, measures 3 wispels, 30 scheffels, 60 fass, 120 himtens, or 480 spints.

The last of oats and barley is only 2 wispels, which are equal to 3 wispels of wheat.

A stock of barley is  $1\frac{1}{2}$  last, 3 wispels, 30 scheffels, 90 fass, 180 himtens, or 720 spints.

A fuder of wine is composed of 6 ahms, 24 ankers, 30 eimers, 120 viertels, 240 stubgens, 480 kanen, 960 quartiers, or 1920 oessels.

A tun of fish oil consists of 2 barrels, each barrel of 32 stubgens.

A tonne of beer is 48 stubgens.

A mile is 24000 Rhenish feet.

The morgen, land measure, is 120 ruthes long and 5 wide; the ruthe is 8 ells, and the klafter 3.

The faden, or fathom, is 80 square zollen, or inches.

An ell of Hamburg is 2 feet, 4 quarters, or 24 inches.

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#### HANOVER.

Accounts are kept in this Electorate in thalers, each thaler consisting of 36 marien groschen of 8 pfenings each.

The other coins are the same as those of Brunswick, and are described under that head.

The coins of Hanover are as follow :

Of gold : the George of  $4\frac{2}{3}$  thalers ; the ducat of  $2\frac{2}{3}$  thalers ; the gold gulden of 2 thalers ; the double, the half, and the quarter gulden, each of proportionate value.

Of silver : the specie reichsthaler of 48 marien groschen ; the zweydrittelstucke of 24 marien groschen ; the half and quarter piece of that name, and of proportionate value.

The marc of Cologne is used for weighing precious metals, silk, and camels' hair.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains ; and in the assaying of silver, into 16 loths, the loth into 18 grains.

A marc of gold of the purity of 23 carats 8 grains is coined into 67 ducats.



A marc of gold of the purity of 18 carats 10 grains is coined into 72 guldens.

A marc of silver of the purity of 14 loths 4 grains is coined into 8 specie reichsthalers; wherefore

9 reichsthalers make 1 marc fine.

The proportion between gold and silver is as 1 to  $15\frac{1}{10}$ .

The pound consists of 2 marcs, 16 ounces, 32 loths, 128 quintins, or 512 oertjens.

The pfund schwer is composed of 3 centners, or 336 pounds; and the centner is 112 pounds.

The schipfund is 20 lispfunds, or 280 pounds; and the lispfund 14 pounds.

A steine of flax is 20 pounds, and of wool 10.

A last of corn measures 2 wispels, 16 malters, or 96 himtens of Brunswick.

A fuder of wine contains 4 oxhofts, 6 ahms, 15 eimers, 24 ankers, 240 stubgens, 480 kannen, or maas, 960 quartiers, or 1920 nœssels.

A tonne or barrel of honey is  $25\frac{1}{2}$  stubgens, and weighs 300 pounds.

A fass of beer is 104 stubgens, or 208 kannen.

A mile of Hanover is 2274 ruthes of Zell.

The ruthe is 16 feet, or 192 inches.

The morgen, land measure, is 120 square ruthes.

An ell is 2 feet, 24 inches, or 288 lines.

#### HEIDELBERG.

In this city, and in all the Palatinate of the Rhine, accounts are kept in guldens, each gulden consisting of 60 kreitzers, and each kreitzer of 4 pfenings.

The gulden is also divided into 15 batzes, 20 groschen, or 30 albus.

The thaler is  $1\frac{1}{2}$  gulden, 45 albus, or 90 kreitzers.

The coins of the Palatinate are as follow:

Of gold: the carolin of 10 guldens 42 kreitzers; the half carolin of proportionate value; the gold piece of 5 thalers, or  $7\frac{1}{2}$  guldens; the Imperial ducat of 4 guldens 48 kreitzers.

Of silver: pieces of 24, 20, 15, 10, 4, and 2 kreitzers, of the same value as convention-money.



A malter of corn measures 4 simmers, 8 mestens, 16 sechters, or 62 gescheids.

The fuder is composed of 10 ahms, 120 viertels, or 480 mas.

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### HILDESHEIM.

In this city of Lower Saxony, accounts are kept in thalers, each consisting of 36 marien groschen, and each of 8 pfenings.

The coins are, pieces of  $\frac{2}{3}$  thaler; of 24, 12, 6, 3, and  $1\frac{1}{2}$  marien groschen; and the Matthews of 4 and 2 pfenings.

The marc of Cologne is used at Hildesheim.

The schipfund consists of 20 lipsfunds, or 280 pounds; the centner of 110 pounds; the lispfund of 14; and the stein of 10.

The pfund schwer is 300 pounds, and the wage 120.

A last of corn measures  $13\frac{1}{3}$  malters, 40 scheffels, or 80 himtens.

A fuder of wine is 4 oxhofts, 6 ahms, 120 viertels, 240 stubgens, 960 quartiers, or 1920 oessels.

An oxhoft of fish oil is 2 tonne, 12 stechkanen, or 192 mingels.

The morgen, land measure, is 120 square ruthes; and the ruthe is 8 ells, or 16 feet.

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### HUNGARY.

All the Austrian coins are current in Hungary.

The specie reichsthaler, called by the Hungarians *egisthaler*, is worth 2 gulden, 20 chustaken, or 40 caszarsgaras.

The current thaler, or *egymagiartaller*, is  $1\frac{1}{2}$  gulden, or 15 chustaken.

The reichs gulden, *egyforinth*, or *nemeczky-zlaty*, is divided into 10 chustaken, 20 caszarsgaras, 40 polturas, 60 kreitzars, 100 penz-kraslawski, 240 pfenings of the Rhine, and 720 babkas.

The uherszki-zlaty . . . . . is  $17\frac{1}{2}$  caszarsgaras;

The pul zlaty . . . . . 10 ditto;

The sesztak, or mariasz . . 17 kreitzars;

The hetes, or szedmak . . . 7 ditto.

The caszarsgara of 4 pataz is worth 6 garas of Upper Hungary, and 5 garas of Lower Hungary.

The gold ducat of Kremnitz is  $4\frac{1}{3}$  reichs gulden; and the letters K. B., which are stamped on each ducat, are the initials of



the words *kermecz* and *banya*, and refer to the mines of Kremnitz.

A marc of gold of the purity of 23 carats 9 grains is coined into 67 ducats.

A marc of fine silver is coined into 25 guldens, composed of pieces of  $\frac{1}{2}$  caszarsgara, polturas, kreitzars, and caszars.

The same marc is also coined into 30 guldens, each gulden composed of pieces of 1 pfening, or 3 babkas.

The other monies, as well as the weights and measures of Hungary, will be found under the head of Vienna.

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#### JAMAICA.

Accounts are kept in Jamaica, and in the other West India islands belonging to Great Britain, in pounds currency, each consisting of 20 shillings, and each shilling of 12 pence currency.

Sterling money is 40 per cent better than currency; whence  
100 pounds sterling make 140 pounds currency.

It is observable, that, while the ratio is permanent for the reduction of sterling into currency, the ratio is variable for the reduction of currency into sterling. The former is readily effected by multiplying by 7, and then dividing by 5.

The guinea is current for 30 shillings; the crown for 7 shillings; the Spanish pistole for 24 shillings; the hard dollar for 6 shillings 3 pence; the bitt, or Spanish real, for  $7\frac{1}{2}$  pence: the value, however, of such coins is subject to variation, according to circumstances.

A hundred weight makes 100 pounds, each of which is equal to the pound avoirdupois of England.

In respect to the measures, see England.

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#### JAPAN.

Accounts are kept in Japan in taels, teels, or taves, each tael consisting of 10 mas, and each mas of 10 kanderies, or conderies. The Dutch reckon the tael for  $3\frac{1}{2}$  current florins.

The currency of Japan consists of ingots, the value of which is determined by their respective weights.

The oban is a gold ingot weighing 826 grains troy weight, of the



purity of 22 carats; the intrinsic value of which is about  $14\frac{1}{2}$  ducats, equivalent to 6 pounds 13 shillings 9 pence sterling.

The coban, or coopang of gold, weighing 275 grains troy weight, and of the purity of 22 carats, is worth 44 shillings 7 pence.

The jehebo is the smallest piece of gold which is current, and is worth about 8 shillings  $8\frac{1}{2}$  pence.

The silver currency consists of bars of the purity of 11 ounces, and of different weights. The heaviest bar weighs about 3479 grains troy weight, and the smallest 85 grains.

The value of the former is  $37\frac{1}{2}$  shillings, and of the latter 11 pence.

The schuit is a silver coin, weighing 2370 grains troy weight, of the purity of 11 ounces, and worth 25 shillings  $6\frac{1}{2}$  pence.

The cash is a copper coin, 600 of which are 1 tael.

The Spanish dollar is worth about 74 conderies.

The pikul, or pecul, consists of 100 cattis, and corresponds with 130 pounds avoirdupois.

A managoga of rice is 10000 ikmagogas.

An ikmagoga is composed of 1000 ikgogas, an ikgoga of 100 gantas, and a ganta of 3 cocas.

Cloths are measured by the inck, or tatamy.

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#### KONIGSBERG.

Accounts are kept at Konigsberg in guldens, each gulden of 30 groschen, and each groschen of 18 pfenings, Prussian currency.

The thaler is  $1\frac{1}{2}$  zweydrittelstucke, 3 guldens, 24 gute groschen, 90 groschen, 270 schillings, or 1620 pfenings.

The coins of Prussia, which are described under the head of Berlin, are current at Konigsberg.

The marc, for weighing precious metals, is the same as that of Dantzic.

The pound is the same as that of Berlin, which is denominated new weight of Prussia, and is 23 per cent heavier than the old weight of Konigsberg.

The schifpfund consists of 3 centners, 20 lispfunds, or 330 pounds new weight.

The centner is 110 pounds, and the lispfund  $16\frac{1}{2}$ .



There are two stein, or stone; the grosse stein of 33 pounds, and the kleine stein of 20.

The pound is divided into 16 ounces, 32 loths, 128 quintins, or 512 pfenings.

A last of corn measures 24 tonnen,  $56\frac{1}{2}$  new scheffels, 60 old scheffels, 240 viertels, 960 metzens. The new scheffel of Berlin is at present used in Prussia.

The measures for liquids are the same as at Dantzic, except that the stof of Dantzic is  $19\frac{1}{3}$  per cent more capacious than that of Königsberg.

The ell of Königsberg is the same as that of Berlin.

The exchange business is considerable at Königsberg, being the centre point between Russia, Hamburg, and Amsterdam.

The course of exchange is as follows:

London receives 19 guildens 4 groschen, more or less, per pound sterling.

Amsterdam receives 308 groschen, more or less, per pound Flemish.

Hamburg receives 135 groschen, more or less, per rixdollar banco.

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#### LEGHORN.

In this city of Italy, accounts are kept in pezze da otto reali, each pezza consisting of 20 soldi, and each soldo of 12 denari da otto reali.

The lira is 20 soldi, or 240 denari di lira.

The scudo d'oro is worth  $7\frac{1}{2}$  lire, and divided into 20 soldi, or 240 denari d'oro.

The current scudo, also denominated ducato, ducatone, or piastra, is worth 7 lire, and divided into 20 soldi, or 240 denari di ducato.

The testono is 2 lire, 3 paoli or reali, 24 crazie, 40 soldi di lira, 120 quatrini, or 480 denari di lira.

These monies are distinguished by the appellation of *moneta buona* and *moneta lunga*; the former is  $4\frac{8}{23}$  per cent of greater value than the latter; whence

23 pieces *moneta buona* make 24 pieces *moneta lunga*.

The coins of Leghorn are the same as those described under the



head of Florence, and their respective value in moneta buona and moneta lunga is as follows :

|                  | Moneta buona.                         | Moneta lunga.                  |
|------------------|---------------------------------------|--------------------------------|
| The doppia is    | .... 23 lire.....                     | 24 lire                        |
| The ruopono      | .... 40 ditto .....                   | 41 ditto 9 $\frac{3}{4}$ soldi |
| The sequino..... | 13 ditto 6 $\frac{1}{2}$ soldi ..     | 13 ditto 18 ditto              |
| The pezza        | .... 5 ditto 15 ditto ..              | 6 ditto                        |
| The piastrina    | .... 1 ditto 8 $\frac{3}{4}$ ditto .. | 1 ditto 10 soldi.              |

The pound, for weighing precious metals, consists of 12 oncie, or ounces, 288 denari, or 6912 grani.

In the assaying of gold, the pound is divided into 24 carati, the carato into 8 octavi; and in the assaying of silver, into 12 oncie, the oncia into 24 denari.

Gold in bars is sold per ounce fine, and silver in bars per pound fine; and the price of each is regulated in lire moneta buona.

Spanish dollars are sold for so many pezze per pound weight; and 1000 dollars correspond with 79 pounds 7 ounces of Leghorn.

The carato, for weighing diamonds, weighs 4 grani.

The pound, commercial weight, is 1 per cent heavier than the pound used for weighing precious metals.

The migliajo consists of 10 centenaji, or 1000 pounds, and the centenajo of 100 pounds.

The cantaro, for weighing sugar, stones, alum, and English cheese, is 150 pounds.

The cantaro, for weighing almost every other description of goods, is 160 pounds.

The moggio, dry measure, is composed of 2 rubbi, 7 $\frac{1}{2}$  sacchi, 22 $\frac{1}{2}$  staji, or 2880 bussoli.

The rubbo is 1440 bussoli, the sacco 384, and the stajo 128.

A barile of wine contains 20 fiaschi, 40 boccali, 80 mezzetti, or 160 quartuci.

A barile of oil is 16 fiaschi, and weighs 85 pounds of Leghorn.

The several measures of Florence for cloth, linen, and stuffs, are used at Leghorn.

#### LEIPSIC.

Accounts are kept at Leipsic, at Dresden, and in the Electorate of Saxony, in thalers, each consisting of 24 gute groschen, and each gute groschen of 12 pfenings currency.



The reichsthaler is  $1\frac{1}{3}$  current thaler, 2 reichs gulden, 32 gute groschen, 384 pfenings, or 768 hellers.

The reichs gulden is 16 gute groschen, the gulden of Misnia 21, the old schock 20, and the new schock 60.

|                                |                     |
|--------------------------------|---------------------|
| 3 effective reichsthalers make | 4 current thalers   |
| 2 current thalers .....        | 3 reichs gulden     |
| 7 ditto .....                  | 8 gulden of Misnia. |

The coins of Saxony are as follow :

Of gold : the august, coined since the year 1753, of 5 thalers ; the double and the half august, of proportionate value ; the ducat, worth from  $2\frac{3}{4}$  to 3 thalers ; the gold gulden, worth from  $2\frac{1}{4}$  to  $2\frac{1}{2}$  thalers.

Of silver : the specie reichsthaler, of 32 gute groschen ; the gulden, which is also called zweydrittelstucke, of 16 gute groschen.

Of silver and copper : pieces of 4, 2, and 1 gute groschen ; pieces of 6, 3, and 1 pfening.

The old coins of Saxony, struck between the years 1690 and 1763, are denominated *constitution-money*. A marc of fine silver was then coined into 9 reichsthalers, 12 thalers, 18 reichs gulden, 36 half gulden, 72 quarter gulden ; and the respective value of such coins was of 32, 24, 16, 8, and 4 gute groschen. The new coins of Saxony are denominated *convention-money*, because they were struck according to the convention which took place in 1763 between the principal members of the Germanic body ; whence the currency of Germany chiefly consists of convention-money. In consequence of such convention, a Cologne marc of silver, of the purity of 13 loths 6 grains, is coined into  $8\frac{1}{3}$  reichsthalers, and the other coins in the same proportion ; so that 10 reichsthalers,  $13\frac{1}{3}$  thalers, 20 reichs gulden, 40 half gulden, and 80 quarter gulden, are struck from a marc of fine silver. And, as the value of those coins is the same as that of the former coins, that is, of 32, 24, 16, 8, and 4 gute groschen, being the present currency of Saxony, it follows that the proportion between constitution-money and convention-money is in the ratio of 10 to 9 ; whence

9 old reichsthalers make 10 new reichsthalers.

There has not been any alteration in respect to the gold coins, which are still struck according to the constitution of the empire.



A marc of gold of the purity of 23 carats 8 grains is coined into 67 ducats, each worth 2 old reichsthalers, or 2 reichsthalers 7 gute groschen actual currency.

A marc of gold of the purity of 18 carats 10 grains is coined into 72 gold guldens, each worth 3 old guldens, or 3 guldens 5½ gute groschen actual currency.

The proportion between gold and silver in Saxony is as 1 to 15 $\frac{1}{10}$ .

The marc of Leipsic and Dresden, for weighing precious metals, is denominated marc of Cologne; but, according to Mr. Tillet, it is a little lighter, and corresponds with 3606 grains troy weight.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains; and in the assaying of silver, into 16 loths, the loth into 18 grains.

The centner, commercial weight, consists of 5 steins, or 110 pounds; but a centner of steel is 118 pounds.

The pound is divided into 2 marcs, 32 loths, 128 quintilins, or 512 pfenings.

A wispel of corn measures 2 malters, 24 scheffels, 96 viertels, 384 metzen, or 1536 mœsgen.

16 scheffels of Leipsic make 21 scheffels of Dresden.

A fuder of wine contains 2 $\frac{2}{3}$  fass, 5 eimers, 756 kannen, or 1512 nœssels.

An eimer of Leipsic is 63 kannen of Leipsic, or 81 kannen of Dresden.

An eimer of Dresden is 72 kannen of Dresden, or 56 of Leipsic.

The ruthe of Saxony is 15 $\frac{1}{8}$  feet of Leipsic; the klafter is 3 ells, or 6 feet; the stab 2 ells, or 4 feet.

An aker, or acre, is 300 square ruthes.

The mile of Saxony is 2000 ruthes, and each ruthe 8 ells of Dresden.

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LIBAU.

In this, as well as in the other cities of Courland, accounts are kept in albertus reichsthalers of 4 orts, or 80 ferdings.

The gulden is 30 groschen, the groschen 3 schillings, and the schilling 6 pfenings.



The schifpfund consists of 20 lispfunds, or 400 pounds.

A last of wheat, rye, barley, and pease, is 48 loofs; of oats and malt 60.

The other measures are the same as those at Riga.

N. B. The old style is still in use at Libau.

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#### LIEGE.

Accounts are kept at Liege in guldens, each gulden consisting of 20 stivers, and each stiver of 4 oertjes, or 16 pfenings.

The patacon is 4 guldens, 8 schillings, 80 stivers, 320 oertjes, or 1280 pfenings.

The coins of Liege are as follow :

Of gold : the ducat of  $8\frac{1}{2}$  guldens, or 17 schillings ; the gold gulden of 5 current guldens.

Of silver : the patacon of  $8\frac{1}{2}$  schillings ; the schilling of 10 stivers ; the blamuse of 5 stivers.

The pound is 4 per cent less than that of Amsterdam.

A last of corn is 17 setiers.

The course of exchange is as follows :

Amsterdam receives 175 guldens, more or less, for 100 current florins.

Paris receives 50 stivers, more or less, for 3 francs.

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#### LISLE.

In this city of France, accounts are kept either in francs and cents, or in livres, sols, and deniers tournois. They are sometimes, also, kept either in livres Flemish, each livre of 20 escalins, or 240 gros ; or in florins, each florin of 20 stivers, and each stiver of 16 pennings.

The livre Flemish is  $2\frac{1}{2}$  écus, 6 florins,  $7\frac{1}{2}$  livres tournois, 20 escalins, 120 stivers, 150 sols tournois, 240 gros, 1800 deniers tournois, or 1920 pennings.

The pound of Lisle is 14 ounces poids de marc of France.

A raziere of wheat weighs about 120 pounds poids de marc.

The lot, liquid measure, is  $2\frac{1}{2}$  pintes of Paris.



The ell is 26 inches of France.

The course of exchange is as follows :

|                 | <i>Uncertain Prices.</i>  | <i>Certain Prices.</i>         |
|-----------------|---------------------------|--------------------------------|
| London .....    | rec.....62 escalins ..... | for.....1 pound sterling.      |
| Amsterdam ..... | rec.....180 florins ..... | for...100 florins banco.       |
| Antwerp.....    | rec.....172 florins.....  | for...100 florins of exchange. |
| Idem .....      | rec.....148 florins.....  | for...100 current florins.     |
| Paris.....      | rec.....96 gros .....     | for... 3 francs.               |

### LUBEC.

In this city of Holstein in Germany, accounts are kept in marcs, each marc consisting of 16 schillings, and each schilling of 12 pfenings lubs current.

The reichsthaler is 3 marcs, or 48 schillings; and the thaler 2 marcs, or 32 schillings.

The other coins current at Lubec are the same as those described under the head of Hamburg; and the same marc is used for weighing precious metals.

The schifffund, commercial weight, consists of 2½ centners, 20 lispfunds, or 280 pounds.

The schifffund, used in respect to the carriage of goods, is 320 pounds.

The centner is 112 pounds, and the lispfund 14.

A stone of flax is 20 pounds, and a stone of wool, or feathers, 10 pounds.

The pfund, or pound, which is ½ per cent lighter than that of Hamburg, is composed of 2 marcs, 16 ounces, 32 loths, 128 quintins, or 512 pfenings.

A last of corn is 8 drœmts, 24 tonnen, 96 scheffels, or 384 fœessers.

69 lasts of Lubec make 70 lasts of Hamburg.

The fuder, liquid measure, contains 6 ahms, 120 viertels, 240 stubgens, 480 kannen, 960 quartiers, 1920 plankens, or 3840 ortes.

A tonne of beer measures 48 stubgens, or 192 quartiers.

The course of exchange is regulated in the same manner as at Hamburg.



## LUCCA.

Accounts are kept in this city of Italy either in lire, each lira consisting of 20 soldi, and each soldo of 12 denari; or in scudi d'oro, each scudo of 12 soldi, and each soldo of 12 denari d'oro.

The same scudo, which is also called scudo di cambio, is  $7\frac{1}{2}$  lire, or 150 soldi di lira.

The coins of Florence are current at Lucca.

The scudo d'oro of  $7\frac{1}{2}$  lire of Florence is worth  $8\frac{1}{4}$  lire of Lucca; and the pezza da otto reali of Leghorn is worth  $6\frac{1}{3}$  lire of Lucca.

Two sorts of pounds are used at Lucca, each consisting of 12 ounces.

The pound, peso sottile, for weighing silks; and the pound, peso grosso, for weighing almost every other description of goods.

100 pounds peso grosso make  $111\frac{1}{2}$  pounds peso sottile.

Corn is measured by the stajo, and oil by the coppo.

Two measures are used for cloths, the braccio and the canna.

4 bracci make 1 canna.

## LUNENBURG.

In this city of Lower Saxony, accounts are kept either in thalers, each thaler consisting of 24 gute groschen, and each gute groschen of 12 pfenings; or in thalers of 36 marien groschen of 8 pfenings each.

The thaler is divided into 24 gute groschen, 32 schwere schillings, 36 marien groschen, 48 leichte schillings, 72 mathiers, 96 wittes, 288 pfenings, or 768 scheffens.

The coins are the same as those of Hanover.

The weight of Lunenburg is nearly the same as that of Hamburg.

215 pounds of Hamburg make 214 pounds of Lunenburg.

A wispel of corn is composed of 20 scheffels, 40 himtens, or 160 spints.

The ell is 2 feet of Lunenburg.

The other measures are referred to under the head of Hanover.



## LYONS.

In this city of France, accounts are kept either in francs and cents, or in livres, sols, and deniers tournois.

The coins of France are current at Lyons, without any difference either in their name or in their value.

Three weights are used at Lyons :

The *poids de marc*, for weighing precious metals ;

The *poids de soie*, for weighing silks ;

The *poids de ville*, for weighing every other description of goods.

The pound *poids de marc* is 16 ounces, 15 of which compose the pound *poids de soie*, and 14 the pound *poids de ville*.

An *asnée* of corn is 6 bichets ; and the bichet, the capacity of which is 1 cubic foot, or *pied de roi*, is divided into 4 coupes, or 16 picotins.

An *asnée* of wine is 88 pots ; and the pot, which is equal to the pinte of Paris, is divided into 2 chopines, or 4 demi septiers.

The ell of Lyons is somewhat shorter than the Paris ell of 524 lines.

99 ells of Paris make 100 ells of Lyons.

## MADRAS.

Accounts are kept in star pagodas, fanams, and cash.

80 cash..... = 1 fanam

35 to 45 fanams = 1 star pagoda.

The government, the banks, and all the houses of agency, keep their accounts at 42 fanams the star pagoda.

The species of coins in general circulation, are

\*1 cash piece of which..... 80 make 1 single fanam.

5 ditto =  $\frac{1}{2}$  doodee, 16 ..... 1 ditto.

10 ditto = 1 ditto .. 8 ..... 1 ditto.

20 ditto = 1 pice.... 4 ..... 1 ditto.

2 single fanams ..... 1 double fanam.

12 single fanams or 6 double..... 1 rupee.

42 single or 21 double fanams, or

3 $\frac{1}{2}$  rupees ..... } 1 star pagoda,

which exchanges for 8 shillings at par.

\* Those cash pieces are small copper coins, struck in England, and sent to this country for general circulation : they bear date 1803, and the value is marked upon each of them.



The European merchants in Madras keep their accounts at 12 fanams the rupee and 42 fanams the star pagoda; but the natives, at 12 fanams 60 cash the rupee, and 44 fanams 50 cash the star pagoda.—The Bazar exchange fluctuates from 35 fanams to 45.

N. B. The star pagoda weighs 2 pennyweights 4 grains.

The candy, which is equivalent to 500 pounds avoirdupois, consists of 20 maunds, 100 vis, 6400 pollams, or 428000 pagodas.

The maund, which corresponds with 25 pounds avoirdupois, is 8 vis, the vis 40 pollams, and the pollam 20 pagodas.

The garce, grain and dry measure, which contains 300,000 English cubic inches, is 80 parrahs, or 400 marcals.

The marcal, the capacity of which is 750 cubic inches, contains 8 measures, and the measure, or puddy, 8 ollocks.

When grain is sold by weight, 9256½ pounds are allowed to a garce.

The puddy, by which milk, ghee, oil, and some other liquids, are sold, is equal to the puddy in grain measure.

The English measures are used for wine and spirits.

A ground, or mauny, land measure, is 60 feet long, and 40 feet broad.

The cawny is 24 maunies, and contains 57600 square feet.

121 English acres are 160 Indian cawnies.

#### MADRID.

Accounts are kept at Madrid, and in Castille, in reales de vellon, each real consisting of 34 maravedis de vellon. They are kept, however, in the Royal Treasury, in escudos de vellon, each escudo consisting of 10 reales de vellon, and each real of 34 maravedis de vellon.

The effective escudo de oro is 40 reals of vellon.

The escudo de plata, or dollar of exchange, is 15 reals 2 maravedis of vellon.

The other coins, as well as the weights and measures, of Castille, are the same as those which are described under the head of Spain.



MAJORCA.

Accounts are kept in this island in *pesos*, or dollars, each peso consisting of 8 reals, and each real of 34 maravedis; or otherwise in libras, each libra consisting of 20 sueldos, and each sueldo of 12 dineros.

There is no difference between the peso and the libra, which are both equal to the dollar of exchange.

The quintal, or cantaro Barbaresco, or of Barbary, for weighing almost every description of goods, consists of 100 rotolos.

The quintal, or cantaro of Majorca, is 104 rotolos.

The carga is 3 quintals of Majorca, or 312 rotolos.

100 rotolos of Majorca make  $91\frac{1}{3}$  pounds of Castille.

Corn is measured by the quartera.

5 fanegas of Castille make 4 quarteras of Majorca.

A cortan, or quartan of oil, weighs 9 rotolos; and 12 quartanes compose 1 odor of 108 rotolos.

The canna is  $1\frac{1}{8}$  yard of England, and

100 varas of Castille make  $48\frac{1}{2}$  cannas of Majorca.

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MALACCA.

In this city of the East Indies, accounts are kept in rixdollars, each consisting of 8 schillings, and the schilling of 8 stuyvers, or 24 duyten.

The ducatoon of Holland is worth 13 schillings

The hard dollar. . . . . 10 ditto

The rupee of Bombay . . . . 5 ditto.

In respect to weights and measures, see Batavia.

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MALAGA.

In this city of the titular kingdom of Granada, in Spain, accounts are kept in reales de vellon of 34 maravedis de vellon each.

The real of vellon is  $8\frac{1}{2}$  quartos, 17 ochavos, 34 maravedis, 68 blancas, 136 cornados, or 340 dineros.

The real de plata doble is equal to the real of old plate.

The ducado del Rey is the same as the ducat of exchange.

The other coins are described under the head of Spain.



The weights of Castille are used at Malaga.

The fanega of Malaga is 10 per cent more capacious than that of Castille ; wherefore

10 fanegas of Malaga make 11 fanegas of Castille.

The arroba, or cantara, for measuring liquids, is composed of 8 azumbres, or 32 quartillos, equal to those of Castille.

The pipe of wine of Malaga contains 35 cantaras, but is reckoned only for 34.

The bota of wine of *Pedro Ximenez* contains  $53\frac{1}{2}$  cantaras.

The bota of oil corresponds with 43 arrobas of Castille.

The carga of raisins weigh 7 arrobas.

The vara of Malaga is the same as that of Castille.

#### MALTA.

Accounts are kept in this island in *scudi*, or current crowns, the scudo consisting of 12 tari, 24 carlini, 240 grani, or 1440 piccioli.

These monies have two values, the one denominated of silver, and the other of copper, or current : the former is to the latter in the proportion of 3 to 2.

The coins of Malta are as follow :

Of gold : the double louis of the purity of  $20\frac{1}{2}$  carats, weighing  $\frac{23}{8}$  of an oncia, and worth  $13\frac{1}{3}$  silver scudi, or 20 current scudi ; the louis and the half louis, in the same proportion.

Of silver : the oncia of the purity of 10 carats, weighing  $1\frac{1}{8}$  oncia, and worth  $1\frac{2}{3}$  silver scudo, or  $2\frac{1}{2}$  current scudi ; the current scudo of  $\frac{2}{3}$  of a silver scudo, or 12 tari.

The pound, for weighing precious metals, is divided into 12 oncie, the oncia into 32 trapesi, and the trapeso into 18 grani ; wherefore the pound is 6912 grani.

In the assaying of gold, the degrees of fineness are expressed by 24 carats ; and in the assaying of silver by 12 carats.

The cantaro consists of 100 rotoli.

A salma of corn contains  $3\frac{1}{4}$  sacchi of Leghorn.



## MANTUA.

In this city of Lombardy, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari.

The scudo is 6 lire, or 120 soldi.

The pound is equivalent to 5083 grains troy weight.

A staro of wheat weighs about 80 pounds of Mantua.

A moggio of oil weighs 320 pounds ditto.

Cloth is measured by the braccio.

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MARSEILLES.

In this city of France, accounts are kept in francs and cents.

The coins of France are current at Marseilles without any distinction.

The *ecu*, or crown of 64 sols, by which, according to Kruse, the price of gall nuts and of cotton was regulated, is no longer in use.

The pound *poids de table* is lighter than the pound *poids de marc*, and is divided into 16 ounces *poids de table*.

100 pounds *poids de marc* make 121 $\frac{7}{8}$  pounds *poids de table*.

A charge of corn is composed of 4 émines, and the émine of 8 sivadiers.

A millerolle of wine consists of 4 scandaux, and the scandal of 15 pots.

A millerolle of oil weighs 144 pounds *poids de table*, and is divided into 4 scandaux; the scandal into 12 livres, each of which is reckoned as 3 pounds weight.

The canne, cloth measure, is 8 pans, and the pan 4 quarts.

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MARTINIQUE.

Accounts are kept in this, as well as in the other West India Islands under the dominion of France, in livres, each livre consisting of 20 sols, and each sol of 12 deniers currency.

The livre of these islands is  $\frac{1}{4}$  per cent less than the livre tournois of France; wherefore

4 livres currency make 3 livres tournois.

The weights and measures are the same as those of France.

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## MEXICO.

In this city, the capital of New Spain, in Peru, in Chili, and in all the other dominions of Spain in North and South America, accounts are kept in *pesos*, or dollars, each peso consisting of 8 reales, and each real of 34 maravedis de plata Mexicanos.

The coins of Spanish America are as follow :

Of gold : the new doblon de à ocho of 16 pesos ; the  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  doblon, in the same proportion.

Of silver : the peso of 8 Mexican reals of plate ; the  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  peso, in the same proportion.

In the assaying of gold, the castellano is divided into 24 quilates, the quilate into 4 granos, and the grano into 8 parts.

In the assaying of silver, the marc is divided into 12 dineros, the dinero into 24 granos, and the grano is reckoned  $8\frac{1}{4}$  maravedis ; whence the marc consists of 288 grains, or 2376 maravedis.

A marc of silver of the purity of  $10\frac{3}{4}$  dineros is worth 8 pesos, more or less.

A marc of fine silver is worth 73 reals of plate, more or less.

The greatest part of the silver drawn from the mines of New Spain is conveyed to Mexico, and is estimated at about 2 millions of marcs per annum. The duties levied for the King of Spain, inclusive of the process of coinage, amount to  $12\frac{1}{4}$  per cent.

The mines of the same country furnish but an inconsiderable quantity of gold, part of which is used for ornaments. At the mint of Mexico, which is the only one in New Spain, the annual coinage of dollars amounts to 12 millions in number ; the coinage of doubloons, within the same term, is of the value of 1 million of dollars.

The regulation of such coinage, and the weights and measures used in Spanish America, are referred to under the head of Spain.

MILAN.

In this city, and in all Lombardy, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari currency.



The scudo Imperiale, or di cambio, is worth 5 lire 17 soldi, or 117 soldi, and the soldo 12 denari Imperiali.

The current scudo is worth 5 lire 15 soldi, or 115 soldi, and the soldo 12 denari currency.

Imperial money is to current money as 106 to 150: in fact, the *Filippo*, or *Philip*, whose value, previously to 1750, was only 106 soldi Imperiali, is at present worth 150 soldi currency.

|                         |                   |
|-------------------------|-------------------|
| 106 lire Imperiali make | 150 lire currency |
| 212 scudi ditto .....   | 1775 lire ditto   |
| 1219 scudi ditto .....  | 1775 scudi ditto  |
| 1219 soldi ditto .....  | 15 scudi ditto    |
| 212 soldi ditto .....   | 15 lire ditto.    |

The coins of Milan are as follow :

Of gold : the doppia, weighing 130 grani, of 25 lire 5 soldi current.

Of silver : the ducatone, weighing 26 denari, of 8 lire 12 soldi current ; the Filippo, weighing 22½ denari, of 7 lire 10 soldi current.

Of silver and copper : the lira of 20 soldi ; the parbajollo of 2½ soldi ; pieces of 1 soldo.

The marc, for weighing precious metals, is composed of 8 oncie, the oncia of 24 denari, and the denaro of 24 grani.

In the assaying of gold, the oncia is divided into 24 carati, the carato into 24 parts ; and in the assaying of silver, into 12 denari, the denaro into 24 grani.

Two weights are used at Milan :

The pound peso grosso consists of 28 ounces, and the pound peso sottile of 12 ounces.

3 pounds peso grosso make 7 pounds peso sottile.

A mina of corn is composed of 4 rubbi, 28 moggi or sacci, 224 stari, or 448 starelli.

A carga of oats is 9 stari, or 18 starelli.

The brenta, liquid measure, consists of 3 stari, 6 mini, 12 quartiri, 48 pinti, or 384 boccali.

A boccalo of wine weighs 1 pound peso grosso.

A rubbo of oil weighs 25 pounds of 12 ounces each.

Two bracci are used at Milan for measuring cloth and silk stuffs.





## MINORCA.

Accounts are kept in this island in libras, or pesos, each consisting of 20 sueldos, and each sueldo of 12 dineros.

The libra, or peso, is worth 128 quartos.

The cantaro is 4 arrobas,  $34\frac{2}{3}$  libras mayores, 104 libras menores, and corresponds with  $90\frac{1}{3}$  libras or pounds of Castille.

The libra mayor is 36 onzas, and the libra menor 12.

The botta menor is 4 cargas, 16 barriles, or 88 quartillos.

1 quartillo of Minorca is  $11\frac{1}{2}$  quartillos of Castille.

## MOCHA.

In this city of Arabia Felix, accounts are kept in piastres of 80 cavears, or carats.

The coins of Mocha are only the commassee of 7 carats, and the carat.

The harraff, by which cotton is sold, is worth 1 piastre 22 cavears.

18 harraffs make 23 piastres.

|                     |                       | £ | s. | d. |
|---------------------|-----------------------|---|----|----|
| 1 carat.....        | = 1 penny and 2-7ths  |   |    |    |
| 7 carats.....       | = 1 commassee.....    | 0 | 0  | 9  |
| 60 commasseees      | = 1 Spanish dollar... | 0 | 4  | 6  |
| 80 cavears....      | = 1 Mocha dollar....  | 0 | 4  | 6  |
| 100 commasseees     | = 1 sequin .....      | 0 | 7  | 6  |
| 80 larins.....      | = 1 tomand .....      | 3 | 7  | 6  |
| 1 venetian produces | 2 dollars 25 cavears. |   |    |    |

## WEIGHTS.

|                           |                               | lb. | oz. | dwt. | gr.   |
|---------------------------|-------------------------------|-----|-----|------|-------|
| 1 carat.....              |                               | 0   | 0   | 0    | 3.02  |
| 16 carats make 1          | coffala.....                  | 0   | 0   | 2    | 9.10  |
| 24 ditto.....             | $1\frac{1}{2}$ ditto 1 mascal | 0   | 0   | 3    | 1.37  |
| 10 caffalas....           | 1 vakia .....                 | 0   | 1   | 0    | 9.13  |
| $1\frac{1}{2}$ vakia .... | 1 beak.....                   | 0   | 1   | 10   | 13.62 |
| 87 vakias...              | 100 Spanish dollars           | 7   | 4   | 73   | —     |

## MOCHA CUSTOM-HOUSE WEIGHTS.

|                 |                     | lbs. | oz. |
|-----------------|---------------------|------|-----|
| 15 vakias.....  | 1 ruttle.....Avoir. | 1    | 2   |
| 40 vakias.....  | 1 maund.....        | 3    | 0   |
| 10 maunds.....  | 1 frazil.....       | 30   | 0   |
| 15 frazils..... | 1 bahaar .....      | 450  | 0   |

1 Mocha bahaar is equal to  $16\frac{1}{2}$  Bombay maunds, 18 Madras maunds, 12 maunds  $15\frac{1}{3}$  seers of Surat, or 6 maunds  $1\frac{1}{3}$  seer Bengal factory.



7 Mocha frazils make 10 Beetlefakée frazils.

The tommand consists of 40 kellas, and weighs 168 pounds avoirdupois in rice.

The gudda, which corresponds to about 2 English gallons, consists of 8 nufieahs, or 128 vakias.

The long iron coid is 27 inches, the coid 18, and the guz 25.

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#### MODENA.

In this Dutchy of Italy, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari.

The coins of Modena are as follow :

Of silver : the Filippo of  $15\frac{1}{2}$  lire ; the scudo of  $3\frac{3}{4}$  lire.

Of silver and copper : the lira of 20 soldi, or bolognini ; the capelono of 5 soldi ; the capelino of  $2\frac{1}{2}$  soldi ; and the soldo of 12 denari.

The quintal consists of 100 pounds.

Corn is measured by the staro or stajo, and cloth by the braccio.

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#### MONTPELLIER.

In this city, and at the sea-port of Cette, both in the department of Herault in France, accounts are kept in francs and cents.

The other coins may be referred to under the head of France.

The quintal consists of 100 pounds, and is equivalent to 81 pounds 9 ounces 18 grains poids de marc.

A setier of corn is 2 émines, or 4 quarts.

A muid of wine is 18 setiers, 24 barils, or 576 pots.

A charge of oil contains 4 barals, 8 émines, 16 quarts, or 128 pots.

The canne consists of 9 palmes, and is 74 inches of France.

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#### MOROCCO.

In this empire of Africa, at Tafilet, Fez, Sallee, Una, and in the other parts of western Barbary, accounts are kept in xerifes, which are divided into 8 parts ; or otherwise, in ducados consisting of 48 blanquillos, each blanquillo of 20 fluces.

The ducado is a gold coin worth about 8 shillings 9 pence.



The blanquillo is therefore worth  $2\frac{3}{16}$  pence.

The pound of Castille is generally used at Morocco for weighing goods.

The almude, or wheat measure of Sallee, is 40 celemines of Castille.

The cahiz, the fanega, and the other Spanish measures, are used at Morocco.

Cloths are measured by the cana of 12 covados of Morocco.

100 canas of Morocco make  $76\frac{3}{16}$  picos Moriscos of Una.

#### MUNICH.

Accounts are kept at Munich, and in all the Electorate of Bavaria, in gulden, each gulden consisting of 60 kreitzers, and the kreitzer of 4 hellers currency.

The thaler is  $1\frac{1}{2}$  gulden,  $22\frac{1}{2}$  batzen, 30 keiser groschen, 36 land muntze, 45 albus, 90 kreitzers, or 360 hellers.

There is another money in Bavaria known by the denomination of schwartze-muntze, or black-money, of which I shall speak under the head of Ratisbon.

The coins of Bavaria are as follow :

Of gold : the carl of . . . . 10 gulden 42 kreitzers

the max . . . . 7 . . . 8 . . .

the ducat . . . . 4 . . . 48 . . .

the gold gulden . . . . 3 . . . 9 . . .

Of silver: the old reichsthaler . . . 2 . . . 24 . . .

the old gulden . . . . 1 . . . 12 . . .

the new reichsthaler . . . 2 . . . 0 . . .

the new gulden . . . . 1 . . . 0 . . .

Of silver and copper : pieces of 30, 24, and 15 kreitzers.

The marc, for weighing precious metals, is the same as that of Cologne.

The centner consists of 100 pounds.

Cloth is measured by the elle, or ell.

#### MUNSTER.

Accounts are kept at Munster, and in almost every part of the Circle of Westphalia, in thalers, each consisting of 28 schillings, and each schilling of 12 pfenings.



The thaler is  $1\frac{1}{2}$  gulden, 8 blamusers, 28 schillings, 36 marien groschen, 336 pfenings, or 672 hellers.

The gulden is 5 blamusers,  $18\frac{2}{3}$  schillings, 24 marien groschen, 224 pfenings, 448 hellers.

The coins of Westphalia are as follow :

Of silver : the gulden of 24 marien groschen ; the marc of 12 ditto.

Of silver and copper : pieces of  $\frac{1}{2}$  and  $\frac{1}{4}$  of a thaler ; and of 1 and  $\frac{1}{2}$  schilling.

Of copper : pieces of 1, 2, 3, and 4 pfenings.

The weights and measures are described under the head of Osnaburg.

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NANTES.

In this city of France, accounts are kept in francs and cents.

The pound poids de marc is used at Nantes.

Cotton, hemp, oil, sugar, wool, and some other articles, are sold by the weight of 50 kilogrammes, corresponding with 102 pounds 2 ounces 29 grains poids de marc.

Coffee, indigo, pepper, and some other articles, are sold by the weight of 5 hectogrammes, corresponding with 1 pound 3 gros poids de marc.

A tonneau of corn is composed of 10 setiers, or 160 boisseaux, and corresponds with 250 decalitres 160 decilitres.

A muid of salt is 52 quartants.

A tonneau of wine contains 2 pipes, the pipe 2 barriques, and the barrique 120 pots. The tonneau corresponds with 9 hectolitres 28 litres.

Brandy is sold per velt of 3 pots each, the velt corresponding with 7 litres 6 decilitres.

Two ells are used at Nantes :

The Nantes ell of 50 inches of France ;

The French ell of 44 ditto.

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NAPLES.

Accounts are kept throughout the continental part of the kingdom of the Two Sicilies in ducati di regno, each ducato consisting of 100 grani.

The ducato di regno is equivalent to 5 tarini, 10 carlini, 40



cinquini, 100 grani, 200 tornesi, 300 quartini, 600 piccioli, or 1200 cavalli.

The coins of Naples are as follow :

Of gold : the doppia of 16 carlini ; the double onza of 60 carlini ; and the onza of 30.

Of silver : the ducato di regno of 10 carlini, and the half ducato of 5 ; the scudo of Sicily of 12 carlini, and the half scudo of 6 ; the taro, or tarino, of 2 carlini ; pieces of 26, 24, 20, and 13 grani.

The pound, for weighing precious metals, and some valuable articles, is divided into 12 ounces ; the ounce, or *onzia*, into 30 trapesi ; and the trapeso into 20 acine. It corresponds, according to Mr. Tillet, with 6039 grains of France, and is, therefore, equivalent to  $4954\frac{1}{8}$  grains troy weight.

The rotolo, for weighing cocoa, coffee, cotton, sugar, and other articles, is divided into  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{6}$ , and  $\frac{1}{8}$ , parts, having not any specific denomination, and weighs  $33\frac{1}{3}$  onzie ; whence 9 rotoli make 25 pounds.

The cantaro grosso is composed of 100 rotoli.

The cantaro piccolo, or quintal, consists of 100 pounds.

9 cantari grossi make 25 cantari piccoli.

The carro of corn is 36 tomoli, and a tomolo of wheat weighs from 45 to 48 rotoli.

A pipe of wine, or of brandy, is 12 barrels, and corresponds with 132 English gallons.

A salma of oil consists of 16 stara, or 320 pignatti : it weighs  $165\frac{1}{3}$  rotoli, and corresponds with 236 gallons of London.

Cloth is measured by the canna of 8 palmi.

#### NARVA.

Accounts are kept either in roubles of 100 copecs each, or in reichsthalers, consisting of 80 copecs, or 64 wittens.

4 roubles make 5 reichsthalers.

All the coins of Russia are current at Narva.

The schifpfund consists of 10 poods, 20 lispfunds, or 400 pounds.

7 schifpfunds of Narva make 8 berckowitz of Russia.

A last of corn measures 24 tonnes, 96 viertels, or 768 kapps.

The ahm, liquid measure, is 4 ankers, or 120 stofs.



### NAVARRRE.

In Spanish Navarre, accounts are kept either in reales of 36 maravedis each, or in ducados and libras, each of which consists of 20 sueldos, or 240 dineros.

The ducado is  $6\frac{8}{15}$  libras,  $10\frac{8}{9}$  reales, 49 tarxas,  $65\frac{1}{8}$  gruesos, 196 ochavos, 392 maravedis, or 784 cornados.

The libra is  $1\frac{2}{3}$  real,  $7\frac{1}{2}$  tarxas, 10 gruesos, 30 ochavos, 60 maravedis, or 120 cornados.

The real is  $4\frac{1}{2}$  tarxas, 6 gruesos, 18 ochavos, 36 maravedis, or 72 cornados.

The doblon de plata of 32 reales is of that value both in currency and under the denomination of a pistole of exchange, a real of Navarre being equal to a real of plate: there are, in the same coin, 144 tarxas, 192 gruesos, or 1152 maravedis.

|                         |       |                       |
|-------------------------|-------|-----------------------|
| 49 pistoles of exchange | make  | 144 ducats of Navarre |
| 49 dollars ditto        | ..... | 36 ditto              |
| 833 ducats ditto        | ..... | 846 ditto             |
| 5 pistoles ditto        | ..... | 96 libras of Navarre  |
| 5 dollars ditto         | ..... | 24 ditto              |
| 85 ducats ditto         | ..... | 564 ditto.            |

The marc of Navarre consists of 8 onzas, 32 quartos, 128 adarmes, 4608 granos, and is heavier than that of Castille.

16 marcs of Navarre make 17 marcs of Castille.

The pound and measures of Castille are used, however, in Navarre.

### NICE.

In this city, now chief of the department of the Maritime Alps, in France, accounts are kept either in lire, each lira consisting of 20 soldi, and each soldo of 12 denari, or in francs and cents.

A sacco of corn contains 3 staji, and the stajo 16 mensinali.

A rubbo of oil weighs 25 pounds of Nice.

Cloths are measured by the palmo and the raso.

### NUREMBERG.

In this city of the Circle of Franconia, in Germany, accounts are kept in guldens, each consisting of 60 kreitzers, and each kreitzer of 4 pfenings.

The gulden is also divided into 20 kayser groschen of 12 pfenings each.



The reichsthaler de espee is  $1\frac{1}{2}$  current thaler, 2 guldens, 6 kopfstucken, 30 batzen, 40 kayser groschen, 120 kreitzers, or 480 pfenings.

The current thaler is  $1\frac{1}{2}$  gulden, 30 kayser groschen, or 90 kreitzers.

3 effective reichsthalers make 4 current thalers  
2 current thalers ..... 3 current guldens.

These monies have three values, distinguished by the appellation of current money, gold money, and white money.

Current money consists of the coins which are received by the Bank of Nuremberg according to their actual price, namely, the carolin of 9 guldens, the louis d'or, formerly coined in France, the Spanish doubloon, the effective reichsthalers. The current money of Nuremberg is, however, no more than the convention money, of which I have spoken under the head of Leipsic, since the effective reichsthaler is worth 2 current guldens.

Gold money consists of the carolin of 9 guldens, which is, however, reckoned for 10 guldens, more or less.

White money is that which is struck in the city of Nuremberg: it consists of pieces of silver and copper, and is 20 per cent less in value than current money.

The coins of Nuremberg are as follow:

Of gold: the ducat of 4 guldens 10 kreitzers currency, or 5 guldens white money; the gold-gulden of 3 guldens 4 kreitzers currency, or 3 guldens 40 kreitzers white money.

Of silver: the old reichsthaler of 2 guldens  $13\frac{1}{2}$  kreitzers currency, or 2 guldens 40 kreitzers white money; the new reichsthaler of 2 guldens currency, or 2 guldens 24 kreitzers white money.

Of silver and copper: pieces of 15, 12,  $7\frac{1}{2}$ , 6, 5, 4, 3,  $2\frac{1}{2}$ , 2, and 1 kreitzer, white money.

The marc, for weighing precious metals, consists of 8 ounces, 16 loths, 64 quintilins, or 256 pfenings.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains; and in the assaying of silver, into 16 loths, the loth into 4 quintilins, or 16 pfenings.

The schiffpfund, commercial weight, consists of 3 centners, or 300 pounds.

A summer of wheat and rye is composed of 2 malters, 16 metzen, or 64 diethausen.



A summer of barley and oats is 4 malters, or 32 metzen.

The fuder, liquid measure, contains 12 eimers, 384 viertels, 768 maas, or 1536 seidel, tavern measure; the excise measure is, however, greater, in the proportion of 16 to 17.

The ruthe, land measure, is reckoned sometimes for 16 feet, and sometimes for 12.

Cloth is measured by the ell, and the foot is 12 inches.

The course of exchange is as follows:

London receives  $9\frac{1}{4}$  current guldens, more or less, per pound sterling.

Amsterdam receives 142 current rixdollars, more or less, for 100 rixdollars banco.

France receives 76 current rixdollars, more or less, for 300 livres tournois.

Hamburg receives 148 current rixdollars, more or less, for 100 rixdollars banco.

#### OSNABURG.

In this city of Westphalia, accounts are kept either in thalers, each consisting of 21 schillings, and each schilling of 12 pfenings; or in thalers of 36 marien groschen, each marien groschen of 7 pfenings.

The thaler is  $1\frac{1}{2}$  gulden, 21 schillings, 36 marien groschen, 72 mathiers, 252 pfenings, or 504 hellers.

The gulden is 14 schillings, 24 marien groschen, or 168 pfenings.

The coins of Osnaburg are as follow:

Of silver: the reichsthaler of  $1\frac{1}{3}$  thaler, or 2 guldens; the gulden and half gulden, of 24 and 12 marien groschen.

Of silver and copper: pieces of 6, 4, 3, 2,  $1\frac{1}{2}$ , and 1 marien groschen; the gœsge of  $5\frac{1}{4}$  pfenings.

Of copper: pieces of 5, 4,  $3\frac{1}{2}$ , and 1 pfening.

The marc, for weighing precious metals, is the same as that of Cologne.

The pfund-schwer is composed of 300 pounds, and the centner of 100.

The pound is divided into 16 ounces, 32 loths, 128 quintins, or 512 pfenings.

A last of corn consists of 100 scheffels, 400 viertels, or 1600 bechers.



The fuder contains 6 malters, 72 scheffels, 288 viertels, or 1152 bechers.

The fuder, liquid measure, consists of 6 ahms, 168 viertels, 672 kannes, 2688 orts, or 10752 stelfgens.

A barrel of beer contains 27 viertels, or 108 kannes.

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### OVIEDO.

Accounts are kept at Oviedo, at Gijon, and in all the Principality of Asturias, in reales de vellon, each real consisting of 34 maravedis.

All the coins of Spain are current in Asturias, without any difference either in their denomination or in their value.

The quintal is composed of 4 arrobas, or 100 pounds of Castille, of 16 ounces each.

The pound of Asturias consists of 24 ounces; and as each ounce is equal to an ounce of Castille, 100 pounds of Asturias make 150 pounds of Castille.

The fanega Asturiana is composed of 12 celemines, or 48 quartillos, and is  $\frac{1}{3}$  per cent greater than that of Castille; whence

3 fanegas of Asturias make 4 fanegas of Castille.

The cantara of wine is divided in the same manner as that of Castille, but is  $16\frac{2}{3}$  per cent more capacious.

6 quartillos of Asturias make 7 quartillos of Castille.

The vara of Asturias is divided in 3 thirds, 4 quarters, or 36 inches.

100 varas of Castille make 97 varas of Asturias.

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### PARIS.

Accounts are kept in francs, each franc consisting of 100 centimes.

For the coins current at Paris, see France.

The pound poids de marc is composed of 2 marcs, 16 ounces, 128 gros, 384 deniers, or 9216 grains.

The muid, corn measure, is divided into 12 setiers, and the setier into 2 mines, 4 minots, 12 boisseaux, or 192 litrons.

A setier of oats consists of 24 boisseaux, 96 picotins, or 384 litrons.



The boisseau measures 16 litrons, and is 640 cubic inches of France.

A sack of flour weighs 325 lbs poids de marc.

A muid of salt is 12 setiers, 48 minots, 192 boisseaux, 3072 litrons, or 49152 mesurettes. It weighs about 4800 pounds, and measures 123774 cubic inches of France.

A muid of charcoal is composed of 20 mines, or 320 boisseaux.

A voie of pit-coal is 15 minots, 30 demi minots, 90 boisseaux, or 360 quartes.

A muid of wine is 36 setiers, or 288 pintes; and the setier is divided into 4 quarts, 8 pintes, 16 chopines, 32 demi-setiers, 64 poinçons, or 256 roquilles.

The velte contains 6 pintes, and the pinte is 48 cubic inches.

A muid of wine is also composed of 2 feuilletes, 3 tierçons, or 4 quartaux.

Brandy is sold by the poinçon of 27 setiers.

There are 3 ells at Paris:

The ell of 44 inches, or 528 lines.

The ell of 43 inches 10½ lines, or 526½ lines.

The ell of 43 inches 8 lines, or 524 lines.

The relation between the cloth measure of France and those of foreign countries was regulated by the ell of 524 lines.

The *toise*, or fathom, is 6 feet, 72 inches, or 864 lines.

The foot, called *pied de Roi*, is 12 inches, or 144 lines; and the *pouce*, or inch, is 12 *lignes*, or lines.

The arpent of Paris, land measure, is 100 square perches, 900 square fathoms, or 32400 square feet. The perche of Paris is 18 feet, or 324 square feet.

The *lieue*, or league of Paris, is 2000 fathoms, or 12000 feet French.

#### PARMA.

In this Dutchy of Italy, accounts are kept in lire, each lira consisting of 20 soldi, and each soldo of 12 denari.

The scudo, money of account, is 7 lire 6 soldi.

The coins of Parma are as follow:

Of gold: the doppia of 72 lire 12 soldi.

Of silver: the ducatono of 24 lire; the scudo of 8 lire 8 soldi; the testono of 6 lire 6 soldi.

Of silver and copper: pieces of 20, 10, and 5 soldi.



The pound, which is 5 per cent heavier than the pound peso sottile of Genoa, is divided into 12 ounces, the ounce into 24 denari, and the denaro into 24 grani.

A staro of wheat is divided into 16 quartarole, and weighs about 102 pounds of Parma.

The brenta, liquid measure, is divided into 36 pinti.

There are three measures used at Parma for cloths, stuffs, and linens:

The *braccio di legno*, for measuring cloths; the *braccio di seta*, for silk stuffs; and the *braccio di filo*, for linens.

#### PATRAS.

Accounts are kept at Patras, and in all the Morea, in piastres of 80 aspers.

For the other monies, see Turkey.

The quintal of Patras is composed of 44 okes, 132 pounds, 1580 ounces, or 17600 drachms.

A sack of currants weighs about 140 pounds of Patras.

A staro of corn consists of 3 bachel.

The pik, cloth and linen measure, is 8 per cent longer than the pik for measuring silk stuffs.

#### PEGU.

In this kingdom of Asia, accounts are generally kept in silver ticals of 16 touch each, the value of which is about 33½ pence sterling.

The only coin is called *ganza*; it is of copper and pewter, and worth about  $1\frac{1}{20}$  penny.

In the assaying of gold and silver, the tical, or unit of reference, is divided into 16 parts, or touch.

The candy consists of 150 vis, and the vis is divided into 4 argitos, 8 abuccos, or 100 ticals. It corresponds with 6 maunds 28 seers Bengal factory, or 500 pounds avoirdupois.

A basket of rice weighs 16 vis, and 40 baskets make 1 ton of rice.



## PERNAU.

In this city of the government of Riga, in Russia, accounts are kept in silver rubles, each ruble consisting of 100 copecs.

The coins of Russia are current at Pernau, and the bank assignments are received at a fluctuating agio from 30 to 50 per cent below their numeral value.

The schiffpfund is 20 lispfunds, or 400 pounds.

The centner is 100 pounds, and the pound is divided into 16 ounces, 32 loths, or 128 quintins.

A last of wheat is 24 tonnes, 48 loofs, or 192 kullmitz.

The last for salt contains 18 tonnes, or 324 kullmitz; and the last for linseed, 12 tonnes, or 24 loofs.

The ahm, liquid measure, is 4 ankers, or 120 stofs.

Cloth is measured by the ell, and 13 ells of Pernau make 10 archines of Russia.

## PERSIA.

In this empire of Asia, accounts are kept in toman, each toman consisting of 1000 dinars-bisti, each of which is 12 dinars.

The toman is divided into 50 abasis, 100 mamudis, 20 zaejiers, 1000 dinars-bisti, 2000 kabesquis, or 10000 dinars.

The coins of Persia are as follow:

Of gold: the cherafi, or tola, of 8 silver larins. The cherafi is struck only upon the accession of a Prince to the throne of Persia, and is therefore to be considered rather as a medal than as a coin.

Of silver: the hasaer-denarie of 10 mamudis; the daezajie of 5 ditto; the larin, or paenzajie, of  $2\frac{1}{2}$  ditto.

Of silver and copper: the abbajer, or abasi, of 2 mamudis; the chodabende, or mamudi; the zaejier of  $\frac{1}{2}$  mamudi.

Of copper: the kabesqui of 5 dinars.

Silver monies are generally reckoned by bags of 50 toman, or 2500 abasis.

100 mamudis of Avesa, or Avisia, in Chusistan, weigh  $71\frac{1}{4}$  miscals, which correspond with 5149 grains troy weight. And as the mamudi contains 2 parts of silver and 3 parts of copper, 100 mamudis, or 1 toman, correspond with  $2059\frac{1}{2}$  grains of fine silver.



The man, or batman, weight of Tauris, is 6 rateles, 300 der-hemes, 600 miscales, or mitigales.

The batman, weight of Chahy, or Cheray, is double that of Tauris.

An artaba of corn contains 25 capichas, or heminas, 50 chenicas, or 200 sextarios.

The legana is 30 chenicas, or 120 sextarios; the collothum is 25 sextarios, and the sabbitha 22.

Three measures are used in Persia for cloths, stuffs, and linens; the gueze, the gueze monkelse, and the arish.

22,28 parasangas, or leagues of Persia, make 1 degree.

### POLAND.

In the States of Poland, accounts are kept in zloti, or florins, each florin consisting of 30 grosz, and each grosz of 12 pfenings.

The currency of Little Poland is of double the value of the currency of Great Poland.

The coins of Poland are as follow:

|                                       | Lit. Poland. |        |    | Gr. Poland. |        |
|---------------------------------------|--------------|--------|----|-------------|--------|
|                                       | Florins.     | Grosz. |    | Florins.    | Grosz. |
| Of gold: the ducat of.....            | 9            | 0      | .. | 18          | 0      |
| Of silver: the reichsthaler .....     | 4            | 0      | .. | 8           | 0      |
| Of silver and copper: the tympe ..... | 0            | 18     | .. | 1           | 6      |
| the szostack .....                    | 0            | 6      | .. | 0           | 12     |
| the trojack .....                     | 0            | 3      | .. | 0           | 6      |
| the polturack .....                   | 0            | 1½     | .. | 0           | 3      |
| Of copper: the grosz .....            | 0            | 1      | .. | 0           | 2      |
| the szlong .....                      | 0            | 0¼     | .. | 0           | 0½     |

The ducats and reichsthalers were struck in Poland since the year 1766, *ad legem imperii*; wherefore 1 marc of gold, Cologne weight, of the purity of 23 carats 8 grains, was coined into 67 ducats; and 1 marc of silver, of the same weight, and of the purity of 14 loths 4 grains, was coined into 8 reichsthalers.

The marc of Warsaw, for weighing precious metals, corresponds with 3114 grains troy weight; that of Cracow with 3069 grains; and that of Wilna, in Lithuania, with 3006 grains.

The pound of Warsaw corresponds with 5853 grains troy weight, and that of Cracow with 6271 grains.

14 pounds of Cracow make 15 pounds of Warsaw; each pound is divided into 48 skoyciec.



The korzec, liquid measure, contains 16 kruskas, or jars, at Cracow, and 24 at Warsaw.

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#### PONDICHERRY.

In this city, situated on the coast of Coromandel, accounts are kept in pagodas of 24 fanams, each fanam of 60 cash.

The rupee is 16 annas, and the anna 30 cash; but the rupee is also divided by the French into 30 sols, and the sol into 12 deniers.

The coins struck by the French are as follow :

Of gold : the pagoda of 24 fanams.

Of silver : the rupee of 7 ditto; the fanam worth  $68\frac{1}{2}$  cash, but reckoned only for 60.

A seer, Malabar weight, of the purity of  $8\frac{1}{2}$  touch, corresponding with  $20\frac{3}{4}$  carats, is coined into  $81\frac{1}{4}$  pagodas,  $71\frac{1}{2}$  of which are equivalent to the marc of France.

A marc of silver of the purity of  $9\frac{5}{8}$  touch, corresponding with 11 ounces 11 pennyweights, is coined into  $21\frac{1}{2}$  rupees.

In the assaying of gold, the tical is divided into 10 *toques*, or touch, and the touch into 128 parts; but in the assaying of silver, the touch is divided into 100 parts only.

The weights for precious metals are no other than the coins of Pondicherry.

3 rupees weigh 10 pagodas; and the weight of the *seyra*, or seer, corresponds with that of  $24\frac{3}{8}$  rupees,  $81\frac{1}{4}$  pagodas,  $731\frac{1}{4}$  fanams, or 117000 nellos.

Silver is sold either by the seer, or by the French marc.

100 French marcs make 88 seers.

The candil of Pondicherry is composed of 20 mons, or 160 bis, and is equivalent to 480 lbs of France.

The bis of Malabar contains 40 paloins, and the paloin corresponds with  $644\frac{1}{2}$  grains of France, or  $528\frac{3}{4}$  grains troy weight.

The garza, dry measure, consists of 600 mercales.

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#### PORTUGAL.

Accounts are kept in Portugal in reis.

The milreis is  $2\frac{1}{2}$  cruzados novos,  $2\frac{1}{2}$  cruzados velhos, 10 tostoens, 25 reales, 50 vintems, or 1000 reis.



The cruzado novo is 480 reis, and the cruzado velho 400.

The tostaõ is 100 reis, the real 40, and the vintem 20.

The coins of Portugal are as follow :

*Coinage previous to the Year 1722.*

|                            | Former value.    | Actual value. |
|----------------------------|------------------|---------------|
| The dobraõ . . . . .       | of 20000 reis    | or 24000 reis |
| The half dobraõ . . . . .  | of 10000 . . . . | or 12000      |
| The doppia moeda . . . . . | of 4000 . . . .  | or 4800       |
| The moeda . . . . .        | of 2000 . . . .  | or 2400       |
| The milreis . . . . .      | of 1000 . . . .  | or 1200       |
| The cruzado . . . . .      | of 400 . . . .   | or 480        |

*Coinage since the Year 1722.*

Of gold : the dobra . . . . . of 12800 reis weighing 1 oz.  
 the meya dobra . . . . . of 6400 . . . . .  $\frac{1}{2}$   
 the quarter dobra . . . . . of 3200 . . . . .  $\frac{1}{4}$   
 the escudo . . . . . of 1600 . . . . .  $\frac{1}{8}$   
 the meyo escudo . . . . . of 800 . . . . .  $\frac{1}{16}$   
 the cruzado velho . . . . . of 400 . . . . .  $\frac{1}{32}$

Of silver : the cruzado novo of 480 reis; the  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ , cruzado of proportionate value.

Of silver and copper : the piece of 6 vintems, or 120 reis; the tostaõ of 5 vintems; pieces of 60 and 50 reis.

Of copper : pieces of 10, 5, 3, and  $1\frac{1}{2}$  reis.

The marc, for weighing precious metals, consists of 8 onzas, 64 outavas, 192 escrúpulos, 4608 graõs, or grains.

In the assaying of gold, the marc is divided into 24 quilates, or carats, the carat into 24 grains; and in the assaying of silver, into 12 dinheiros, or pennyweights; the pennyweight into 24 grains.

There has not been any alteration in the weight, standard, or value of the gold coins of Portugal, since the year 1722.

A marc of gold of the purity of 22 carats is coined into 8 dobras, 16 meyas dobras, 32 quarter dobras, 64 escudos, 128 meyo escudos, or 256 cruzados velhos.

A marc of silver of the purity of 10 pennyweights 19 grains is coined into  $13\frac{1}{3}$  cruzados novos, or new cruzades, which is the denomination of those that have been struck since the year 1750.

The proportion between gold and silver in Portugal is as 1 to 16.



The carat for weighing diamonds is divided into 4 grains.

The weight of the carat of Portugal is very nearly the same as that of the English carat.

The pound, commercial weight, consists of 2 marcs, 16 ounces, or 96 outavas.

The quintal is composed of 4 arrobas, or 128 pounds, and the arroba of 32 pounds.

A moyo of corn consists of 15 fanegas, 60 alqueires, 480 selmis, or 960 mequias.

The fanega is 4 alqueires, and the alquier is divided into halves and quarters.

6 alquiers of Lisbon make 5 alquiers of Viana

60 alquiers of Viana..... 59 alquiers of Porto

8 alquiers of Lisbon .... 9 alquiers of the Azores.

A tonelada of wine is composed of 2 pipas, or botas, 52 almudes, 104 alquieres, or potes, 624 canhadas, or 2496 quartilhos.

The pipa is 26 almudes, and the barril 18.

An almude is 12 canhadas, or 48 quartillos.

The measures used for liquids at Oporto are 30 per cent more capacious than those at Lisbon; wherefore

100 canhadas of Porto make 130 canhadas of Lisbon.

Two measures are used in Portugal for cloths, the vara and the covado.

The vara consists of 5 palmos menores, and the covado of 3 palmos craveiros.

The English yard is sometimes used at Lisbon for measuring certain articles imported from Great Britain.

21 varas of Portugal make 34 covados of Lisbon

5 varas of Portugal .... 6 yards of England

20 yards of England .... 27 covados of Lisbon.

The covado used at Oporto is somewhat shorter than that of Lisbon.

150 covados of Oporto make 147 covados of Lisbon.

The foot of Lisbon is half of the covado.

#### PRAGUE.

At Prague, and in all Bohemia, accounts are kept in guldens, each consisting of 60 kreitzers, and each kreitzer of 4 pfenings.



The reichsthaler de espee is  $1\frac{1}{2}$  thaler, 2 guldens, 40 kayzers groschen, 120 kreitzers, or maley-gross, 160 groschels fiedermaus, 360 bili-peniz, or 480 pfenings.

The current thaler is  $1\frac{1}{2}$  gulden, or 90 kreitzers.

Accounts are also kept in *kopy-grosuw-czeskich*, or schocks of groschen of Bohemia. 1 schock is 2 thalers, 3 guldens, 60 groschen of Bohemia, or 180 kreitzers.

The schock, called *kopy-missenki*, is composed of 30 bili-gross, 70 kreitzers, or 280 pfenings.

The coins circulating in Bohemia are as follow :

Of gold : the ducat kremnitz of Hungary of 4 guldens 12 kreitzers ; the Imperial ducat of 4 guldens 10 kreitzers.

Of silver : the reichsthaler of convention of 2 guldens.

Of silver and copper : pieces of 20, 17, 10, and 7 kreitzers convention-money.

Of copper : pieces of  $\frac{1}{2}$  groschen, and  $\frac{1}{2}$  kreitzer currency of Bohemia.

The centner consists of 120 pounds, and the stein of 20.

The pound is divided into 32 loths.

The strick, dry measure, contains 4 viertels, 16 maassels, or 192 seidels.

A fass of wine measures 4 eimers, 128 pints, or 512 seidels.

Cloth is measured by the ell.

#### PRINCE OF WALES ISLAND.

##### CURRENCY.

10 pice..... 1 copong (*Imaginary*)

10 copongs or 100 pice .. 1 Spanish dollar.

Pice should be pure tin ; 16 pice are 1 catty, or  $1\frac{1}{4}$  lb English. On the exchange of dollars into pice, in the bazar, there is a loss of 2 per cent ; on dollars without the King of Spain's head, there is a loss of 10 per cent ; and, in general, 5 or 10 on all dollars defaced.

##### WEIGHTS.

16 tales..... 1 catty

100 catties ..... 1 pecul

40 peculs ..... 1 coyan

3 peculs large.... 1 bhar, equal to 428 lbs avoirdupois.

There are two kinds of catties used in the bazar, the Chinese and Malay.



The Chinese catty . . . . weighs . . . . 22½ dollars  
 The Malay catty . . . . . — . . . . 24 dollars.

The Chinese catty is the Bazar weight, and is equal to 1½ lb English. By the long or large pecul, which is 9 lbs more than the common pecul, the merchants purchase pepper, tin, &c. &c.

The pecul is . . . . . 133½ lbs English  
 The coyan is . . . . . 5323 ditto  
 1 bag of salt . . . . . 100 ditto  
 1 bag of rice . . . . . 164 ditto  
 1 bag of dholl . . . . . 164 ditto.

The two latter, in general, are sent from Bengal in bags of 4 maunds each, the maunds of 82 lbs English.

GOLD AND SILVER WEIGHT.

16 myams equal to 1 bunkall, which is of the weight of 2 Span. dollars  
 20 bunkalls make 1 catty, equal to 20 oz. 15 dwts. 11½ grs. troy weight.

N. B. The bunkall does not weigh quite 2 dollars; the nearest calculation is 1 oz. 9 dwts. 10½ grs.

LAND MEASURE.

1 jumba . . . . . is . . . . . 12 feet square  
 20 jumbas . . . . . are . . . . . 1 orlong  
 An orlong is, as near as possible . . . . 1½ acre.

Cloth is sold by the astah, which is equal to a cubit of 18 inches.

MEASURES BY WHICH OIL, GRAIN, &c. ARE SOLD.

Choopahs . . . . are . . 1 ganton, equal to 1½ gallon nearly  
 Gantons . . . . . 1 parra  
 Parrahs or 40 peculs . . 1 coyan 2 tons. 7 cwt. 2 qrs. 3 lbs. or 5323 lbs.  
 20 gantons of rice . . . 1 bag  
 40 bags or 800 gantons, 1 coyan or 5323 lbs. English.

RATISBON.

In this city of Germany, accounts are kept in guldens, each consisting of 60 kreitzers, and each kreitzer of 4 pfenings.

The current thaler is 1½ gulden, 22½ batzen, 30 kaysers-groschen, 36 land-muntzen, 45 albus, 90 kreitzers, 360 pfenings, or 720 hellers.

These monies are denominated *weisse-muntze*, or white money, in order to distinguish them from the monies denominated *schwartze-muntze*, or black money, which are as follow :

The *pfund*, or pound, is divided into 41 schillings, 164 gros-



chen, 492 regens purgers, 1230 pfenings, or 2460 hellers black money, and corresponds with  $5\frac{1}{4}$  guldens white money.

The pfund pfening is 8 schillings, 32 groschen, 96 regens purgers, 240 pfenings, or 480 hellers, black money, and corresponds with  $1\frac{1}{4}$  gulden white money.

The coins of Ratisbon are as follow :

Of gold : the ducat of 4 guldens 10 kreitzers white money.

Of silver : the effective reichsthaler of 2 guldens.

According to Mr. Tillet, four weights are used at Ratisbon :

The first, denominated *crown-weight*, is divided into 12 parts, and composed of a pile of 128 crowns. The first part is half the pile, and weighs 64 crowns; the six following parts weigh respectively 32, 16, 8, 4, 2, and 1 crown; and, lastly, the 5 other parts are respectively  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ , and two quantities each  $\frac{1}{16}$ , of a crown.

The pile of 128 crowns is used for weighing gold in bars, and corresponds with 8088 grains of France, or  $6635\frac{1}{4}$  grains troy weight.

The second weight is a small pile composed of 11 parts; it corresponds in weight with 64 ducats, for weighing which it is used. It is equivalent to 4208 French grains, or  $3452\frac{1}{4}$  grains troy weight.

The third weight, or the marc for weighing silver and bread, consists of 8 ounces, or 64 drachms : the ounce is divided into 8 drachms, and the drachm into 8 parts. This marc corresponds with 4632 grains of France, or 3800 grains troy weight.

The fourth weight, or the pound, commercial weight, consists of 2 marcs, 32 loths, 128 quintins, or 512 pfenings, and corresponds with 8777 grains troy weight.

The centner is 100 pounds.

A schaf of wheat contains 4 meess, 16 vierlings, or 32 metzens.

A schaf of oats measures 4 meess, 28 vierlings, or 56 metzens.

An eimer of wine is 32 viertels, 88 kœpfe, or 176 seidels.

An eimer of beer is 64 kœpfe, or 128 seidels.

Cloth is measured by the ell.

## REVEL

In this city, situated on the south shore of the Gulph of Finland, accounts are kept in rubles, each ruble consisting of 100 copecks.



The reichsthaler is 64 weissens, or wittens, or 80 copecks; and the thaler 52 wittens, or 65 copecks.

4 rubles make 5 reichsthalers

13 ditto..... 20 thalers

13 reichsthalers 16 ditto

4 wittens..... 5 copecks.

The coins of Revel consist of the Livonina, which is worth 96 copecks, coinage of 1755, or 112 copecks, coinage of 1764; and of pieces of 4 and 2 copecks each.

The marc, for weighing gold and silver, is composed of 16 loths, 64 quintins, or 256 oertleins.

The schifpfund is 20 lispfunds, or 400 pounds.

The pound consists of 16 ounces, 32 loths, or 128 quintins.

19 pounds of Revel make 20 pounds of St. Petersburg.

A last of wheat is 24 tonnen, or 72 loofs.

A tonne of wheat is 3 loofs, and of salt 4.

The loof is 3 kulmitz, or 36 stofs.

An oxhoft of wine measures 1½ ahm, 6 ankers, 180 stofs, or 720 quartiers.

A fass of beer and of brandy is 128 stofs.

The stof of oil weighs 2½ pounds of Revel.

The ell, cloth measure, consists of 2 feet, or 24 inches.

4 ells of Revel make 3 archines of Russia.

#### RIGA.

Accounts are kept in Albertus reichsthalers, or rixdollars, each consisting of 80 ferdings.

The reichsthaler is also divided into 90 groschen.

The coins circulating at Riga are as follow:

Of gold: the Dutch ducat, worth 2 rixdollars 15 ferdings, more or less.

Of silver: the Albertus reichsthaler of 80 ferdings, and the Livonina of 70 ferdings.

Of silver and copper: pieces of 5 ferdings, of 4 and 2 copecks.

Russian silver currency and bank notes are received at variable prices; the former from 127 to 130 copecks, and the latter from 155 to 176 copecks, per Albertus rixdollar respectively.

The marc, for weighing precious metals, consists of 8 ounces, 16 loths, or 64 quintins.



In the assaying of gold, the marc is divided into 24 carats, each carat into 12 grains; and in the assaying of silver, into 16 loths, each loth into 18 grains.

The schiffpfund, commercial weight, is composed of 4 loofs, 20 lispfunds, or 400 pounds.

The pound consists of 2 marcs; the marc itself is the same as that used for weighing gold and silver, and has the same divisions.

A last of wheat and of barley is 24 tonnen, 48 loofs, or 288 kulmitz, which correspond with 16 chetwers of Russia.

A last of rye is 22½ tonnen, 45 loofs, or 270 kulmitz, and measures 15 chetwers of Russia.

A last of oats, pease, and malt, is 30 tonnen, 60 loofs, or 360 kulmitz, and measures 20 chetwers of Russia.

The loof consists of 6 kulmitz, 27 kannen, or 48 stofs, and is reckoned 1½ bushel English measure.

3 loofs make 1 Russian chetwer.

The fuder is composed of 6 ahms, 24 ankers, 120 viertels, or 720 stofs.

The Russian wedra contains 10 stofs of Riga.

A tonne of beer measures 90 stofs.

The ell is 2 feet, or 24 inches.

13 ells of Riga make 10 archines of Russia.

The course of exchange is as follows:

London receives 410 groschen, more or less, per pound sterling.

Amsterdam gives 105 current rixdollars, more or less, for 100 Albertus rixdollars.

Hamburg either receives 102 Albertus rixdollars, more or less, for 100 rixdollars banco, or gives 102 rixdollars banco, more or less, for 100 Albertus rixdollars.

#### ROCHELLE.

In this town of France, seated on the Bay of Biscay, accounts are kept in francs, each consisting of 100 centimes.

The coins circulating at Rochelle, as well as the weights, are referred to under the head of France.

A tonneau of wheat is 42 boisseaux.



The cent of salt is composed of 28 muids, or 672 boisseaux ; and the muid of 24 boisseaux.

Brandy is sold in francs per 27 velts.

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### ROME.

Accounts are kept in scudi moneta, or scudi Romani, each scudo consisting of 10 paoli, or giuli, and each paolo of 10 bajocchi.

The scudo is also divided into  $3\frac{1}{3}$  testoni, 500 quatrini, or 1000 mezzi quatrini.

The scudo di stampa d'oro consists of 20 soldi d'oro, or 240 denari d'oro : it is reckoned for  $152\frac{3}{10}$  bajocchi, in respect to the payment of bills in scudi di stampa d'oro drawn upon foreign places, and negotiated at Rome ; but it is reckoned for  $152\frac{1}{2}$  bajocchi in regard to the payment of bills drawn upon Rome from foreign places.

The coins of Rome are as follow :

Of gold : the doppia of 33 paoli ; the scudo d'oro  $16\frac{1}{2}$  ditto ; the zecchino  $20\frac{1}{2}$  ditto.

Of silver : the piastra vecchia of  $10\frac{1}{2}$  paoli ; the scudo moneta 10 ditto ; the testono 3 ditto ; the papeta 2 ditto.

Of silver and copper : the paolo, or giulo, of 10 bajocchi ; the carolino  $7\frac{1}{2}$  ditto ; the bajocchello 2 ditto.

Of copper : the bajocco of 5 quatrini, or 10 mezzi quatrini ; the mezzo bajocco 5 ditto ; the quatrino 2 ditto ; the mezzo quatrino.

The Roman pound, the standard of which is kept in the Capitol, is divided into 12 ounces : according to Mr. Tillet, it is equivalent to 6386 French grains ; wherefore it corresponds with 5239 grains troy weight.

The pound by the public scale is 2 per cent heavier, and it is customary to deduct 4 per cent from the weight of goods.

The quintal is reckoned either 100, 160, or 250 pounds of the weight by public sale.

A rubbo of corn is 4 quarti, 12 staja, or 16 starelli.

A bota of wine is 9 barili, 288 boccali, 1152 foglietti, or 4608 cartocci. The barile is 32 boccali, the boccalo 4 foglietti, and the foglietto 4 cartocci.



Cloth, silk stuffs, and linens, are measured either by the canna, the braccio, or the palmo.

### ROSTOCK.

In this city of the Dutchy of Mecklenburg, in Germany, accounts are kept either in thalers of 48 schillings, or in zweydrittels, or two-third pieces of 32 schillings, each schilling consisting of 12 pfenings.

The thaler is  $1\frac{1}{2}$  reichs gulden, 2 Mecklenburg gulden, 3 marcs, 24 groschen, 48 schillings, 192 wittens, or 576 pfenings.

The coins circulating at Rostock are pieces of 32, 16, 8, 4, 2, and 1 schilling, of 6 and 3 pfenings, currency of Mecklenburg-Schwerin.

The coinage of the monies of Mecklenburg has been regulated since the year 1763 as follows:

A Cologne marc of fine silver is coined into  $11\frac{1}{3}$  thalers, 17 zweydrittels, or 34 marcs.

The standard of those coins is 9 pfenings. The smaller pieces are coined in the same proportion as to weight, but their standard is only  $7\frac{1}{2}$  pfenings.

The schiffpfund, commercial weight, is 20 lispfunds, or 320 pounds; the lispfund is 16 pounds.

The schiffpfund, for weighing lead and iron, is 280 pounds.

A stone of flax is 20 pounds, and of wool and feathers 10.

The pound consists of 2 marcs, 32 loths, or 64 quintilins.

A last of wheat, composed of 8 droemts, or 96 scheffels, is reckoned  $13\frac{1}{2}$  quarters Winchester measure.

The last of oats renders about 15 quarters.

The measures for liquids are the same as those at Hamburg.

The ell is 2 feet, and 100 feet of Mecklenburg make  $100\frac{1}{8}$  feet of Rostock.

### ROTTERDAM.

In this city of Holland, accounts are kept in gulden, or florins, each gulden consisting of 20 stuyvers, and each stuyver of 16 penningen.

The other monies are referred to under the head of Amsterdam.

The pound, commercial weight, is the same as that at Amster-



dam ; but the retailers use another which is 5 per cent lighter than the former.

A last of corn is composed of  $2\frac{2}{3}$  hoeds, 29 sakken, or 87 achtendeelen. This last is  $3\frac{1}{4}$  per cent more capacious than that of Amsterdam, though they be reckoned alike.

28 lasts of Rotterdam make 29 lasts of Amsterdam.

Brandy is sold per 30 viertels.

Olive and whale oil are sold by the tonne of 240 stoopen.

The other measures for liquids, as well as the ell, are the same as those at Amsterdam.

#### ROUEN.

In this city of France, accounts are kept in francs and cents.

Two weights are used at Rouen : the quintal *poids de marc* for weighing almost every description of goods ; and the quintal *poids de vicomté* for weighing wools. Independently of the latter being 6 per cent heavier, a draft of two pounds per cent is allowed to the purchaser of goods by this weight ; wherefore

100 pounds *poids de vicomté* make 108 pounds *poids de marc*.

A muid of wheat consists of 12 setiers, 24 mines, or 96 boisseaux.

The ell for measuring cloths and silk stuffs is 516 lines of France ; the ell for measuring linen  $619\frac{1}{3}$  ; and the foot 120.

#### RUSSIA.

Accounts are kept throughout this empire, in rubles, each consisting of 100 copecks.

The ruble is also divided into 10 griwnas, or grieveners,  $33\frac{1}{3}$  al-tins, 50 grosz, 100 copecks, 200 denuschkas, or 400 poluschkas.

The coins of Russia are as follow :

Of gold : the Imperial of 10 rubles ; the half Imperial of 5 ; the double ducat of  $4\frac{1}{2}$  ; and the ducat of  $2\frac{1}{4}$ .

Of silver : the ruble of 100 copecks ; the half and quarter ruble of proportionate value ; pieces of 15 and 10 copecks ; the piat kopie of 5 copecks.

Of copper : pieces of 5, 2, and 1 copeck ; the denuschka of  $\frac{1}{2}$  copeck ; and the poluschka of  $\frac{1}{4}$  copeck.

Dutch ducats and rixdollars, as well as Albertus rixdollars, are



in circulation, and taken at various prices according to their weight.

14 rixdollars of Holland, or Albertus, should weigh 1 Russian pound.

Bank assignments are received in payment, and are subject to a discount of 30 per cent, more or less.

The Assignment Bank was instituted in 1768, and opened in 1770, at St. Petersburg and at Moscow. Several bank comptoirs were afterwards established in others of the towns, called government towns. Assignations of 100, 50, and 25 rubles, were issued upon payment of similar sums in copper money, which were refunded upon presentation of those assignments.

The Bank, however, at St. Petersburg was changed in 1786 into a *Reichs* or Imperial Assignment Bank. The former notes were all called in, and exchanged for new ones, issued on several sorts of paper manufactured for the purpose. The present assignments of 100, 50, and 25 rubles, are on white paper; those of 10 rubles on red paper, and of 5 rubles on blue paper. The Bank exchanges torn or injured notes for new ones, or repays the value on demand.

According to a declaration made by Government, the amount of the Bank assignments is never to exceed the sum of one hundred million of rubles.

In the assaying of gold and silver, the unit of reference is divided into 96 solotnicks.

The coinage was regulated by an ukase of the 23d of November 1755, as follows:

The Imperial of 10 rubles to weigh  $3\frac{5}{8}$  solotnicks of gold, of the purity of 88 solotnicks, or 22 carats.

A pound of gold of the purity of 94 solotnicks, or  $23\frac{1}{2}$  carats, was coined into  $117\frac{1}{4}$  ducats.

The ruble of silver to weigh  $6\frac{1}{8}$  solotnicks, of the purity of 76 solotnicks.

An ukase of the 18th December 1763, regulated the coinage of the Russian coins in the following manner:

The Imperial to weigh  $3\frac{3}{4}$  solotnicks, and to be of the same purity as that fixed in 1755.

118 ducats, of the purity of 93 solotnicks, were struck from a pound of gold.

$17\frac{1}{3}$  rubles, of the purity of 72 solotnicks, or 9 ounces, were struck from a pound of silver.



Another alteration has been lately introduced in respect to the coinage of Russia, by an ukase of Paul I., confirmed by another ukase of Alexander I., and dated in the month of December, 1801.

$22\frac{3}{4}$  rubles are to be struck from a pound of silver of the purity of  $83\frac{1}{2}$  solotnicks; and the Imperials and half Imperials, being the only monies of gold to be coined in Russia, are to be of the purity of  $94\frac{1}{2}$  solotnicks.

The *berckowitz*, or berquet, commercial weight, consists of 10 poods, or 400 pounds, and the pood of 40 pounds.

The pound is divided into 96 solotnicks, and the solotnick into 2, 4, or 8 parts.

The *czetwer*, or chetwert, dry measure, is composed of 2 osmins, 4 pajacks, 8 chetwericks, or 64 garnitzen.

16 chetwerts are reckoned 1 last; and the chetwert is about  $5\frac{1}{2}$  bushels Winchester measure.

The cask, liquid measure, contains 40 wedras, 320 kruskas, or 3520 charkas. The wedra is 8 kruskas, and the kruska 11 charkas.

A hogshead of Bordeaux wine is 19 wedras at St. Petersburg; and 3 kruskas make 1 gallon of beer, English measure.

The archine, or Russian ell, is divided into 16 werschocks, and is equivalent to 28 inches English; wherefore

7 yards make 9 archines.

The werste, or Russian mile, measures 500 sachines, 1500 archines, or 24000 werschocks, and corresponds with 3500 English feet, or 3400 Rhenish feet.

The sachine is 3 archines, 48 werschocks, and corresponds with 7 English feet.

The English foot and the Rhenish foot are both used in Russia.

34 Rhenish feet make 35 English feet.

The *dessatina*, land measure, is 560 Rhenish feet long, 210 wide, and contains 117600 square Rhenish feet.

N. B. The preceding weights and measures are general throughout the empire of Russia, excepting in the possessions recently acquired, where their former weights and measures are still in use, which, however, are reduced into those of Russia in their official accounts and transactions.



**ST. CROIX, or SANTA CRUZ.**

In this island, as well as in that of St. Thomas, both belonging to Denmark, accounts are kept in piastres, pieces of eight, or current dollars of 8 reals, or bits.

The hard dollar is worth 10 reals, or bits, at each of those islands. St. Thomas is the principal of the group called the Virgin Islands; and St. Croix is to the southward of that group.

The coins in circulation consist of hard dollars, joanese, guineas, and bits.

The weights and measures are the same as those of Denmark.

**ST. EUSTATIA.**

In this island, as well as in that of Saba, both belonging to the Dutch; and at the island of St. Martin, which is jointly possessed by the French and the Dutch, accounts are kept in dollars, each consisting of 8 reals, and each real of 6 stivers.

The hard dollar, denominated *gourde*, is worth 11 reals.

The weights and measures are referred to under the head of Amsterdam.

**ST. GALL.**

In this city of Switzerland, accounts are kept in guildens, or florins, each florin consisting of 60 kreitzers, and each kreitzer of 8 hellers.

The florin is also divided into 10 schillings, 15 batzen, 60 kreitzers, or 480 hellers.

These monies are distinguished by the appellations of exchange money, and of current money.

1190 florins exchange money make 1383 current florins.

The Spanish pistole, and the old louis d'or of France, are each worth 6 florins 36 $\frac{2}{3}$  kreitzers of exchange, or 7 florins 58 kreitzers currency.

The French gold piece of 24 livres tournois is worth 8 $\frac{1}{20}$  florins of exchange, or 11 current florins.

Two weights are used at St. Gall:

100 pounds heavy weight make 125 $\frac{3}{4}$  pounds light weight.

There are two ells:

100 ells linen measure make 130 ells cloth measure.



## ST. MALO.

In this sea-port of France, accounts are kept in francs and cents.

The weight denominated *poids de marc* is used at St. Malo.

The tonneau of wheat is composed of 31½ boisseaux, and weighs about 2250 pounds.

The boisseau is divided into 12 godets.

A jutte of salt consists of 33 pots, and 21 juttés make 1 tonneau, which weighs about 2600 pounds.

Two ells are used at St. Malo: the ell of Bretagne of 50 inches, and the Paris ell of 52½ lines.

## ST. SEBASTIAN.

Accounts are kept in this city of Biscay in reals of vellon, each real consisting of 34 maravedis.

The other coins are referred to under the head of Spain.

The quintal macho, for weighing iron, consists of 150 pounds.

Salted cod-fish is sold by the quintal of 105 pounds; grocery by that of 100 pounds.

The quintal, for weighing every other description of goods, consists of 101 pounds, and is equivalent to 107 pounds of Castille.

The measures are described under the head of Spain.

At Bilboa, cod-fish is sold by the quintal of 104 pounds of Bilboa.

At St. Antler, where the weight of Castille is used, the quintal of iron is 155 pounds, of cod-fish 112, and of cocoa 107.

## SARDINIA.

Accounts are kept in this island in lire, each lira consisting of 20 soldi, and each soldo of 12 denari.

The lira is also divided into 4 reali of Sardinia, and the real into 5 soldi, 30 calari, or 60 denari.

The scudo of Cagliari is 10 reals, and the scudo of Piedmont 7½ reals 1 calaro.

The Spanish hard dollar is worth about 11 reals 1 soldo.



The cantara consists of 104 pounds, and the pound of 12 ounces.

A restiera of wheat measures 3 starelli, or 48 imbutti ; and the starello weighs about 96 pounds of Sardinia.

Cloths are measured by the palmo.

100 palmi of Sardinia make 124 $\frac{7}{8}$  palmi of Cagliari.

### SAYD, OR SIDON.

In this city of Syria, accounts are kept in piastres, or medins, consisting of 80 aspers each.

Two sorts of weights are used at Sayd :

The Damascus rotolo, for weighing silk and cotton yarn, is 600 drachms. The rotolo of Acre serves for weighing every other description of goods.

100 rotolos of Acre make 127 $\frac{8}{9}$  Damascus rotolos.

The pik of Sayd is equal to that of Aleppo.

### SCOTLAND.

Since the Union of Scotland and England, on the 1st of May, 1707, by the name of the Kingdom of Great Britain, the English coins, weights, and measures, are used in the commercial places of Scotland, and are referred to under the head of England.

As, however, the Scotch weights and measures have still been retained in many places by the force of habit, I think it necessary to subjoin the undermentioned description.

The Scotch pound consists of 12 ounces, and weighs 7616 grains troy weight.

92 pounds of Scotland make 100 pounds avoirdupois

90 ditto..... 119 ditto troy weight.

A firloft of wheat measures 21 $\frac{1}{2}$  pints of Scotland, and that of barley 31.

85 firlofts of barley make 124 firlofts of wheat

112 firlofts of wheat..... 113 English bushels

36 firlofts of barley .... 53 ditto ditto.

The pint of Scotland measures 103 $\frac{404}{1000}$  cubic inches of England.

31 pints of Scotland make 91 beer pints of England

12 ditto..... 43 wine ditto.



The Scotch ell is  $37\frac{1}{3}$  English inches.

30 ells of Scotland make 31 English yards

23 ditto..... 19 ditto ells.

The Scotch foot is  $12\frac{1}{5}$  English inches.

180 feet of Scotland make 181 feet of England.

The Scotch mile measures 5952 English feet.

118 miles of Scotland make 133 miles of England.

The Scotch acre of land measures 55353 $\frac{1}{2}$  square feet English.

84 acres of Scotland make 107 acres of England.

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SIAM.

In this kingdom of Asia, accounts are kept in ticals, each consisting of 16 vis, and each vis of 9 renguis.

The cattis is 20 tals, or tales, 80 ticals, 320 mayons, or miames, 640 fouangs, 512000 cauris.

10 mayons make 1 tale of China ; wherefore

10 tales of Siam make 8 Chinese tales.

The coins of Siam are as follow :

Of gold : the tical, worth 10 ticals of silver.

Of silver : the tical, the mayon, and the fouang.

Of lead : the rengui.

The Spanish dollar is worth 8 mayons.

2 hard dollars are equal to 3 silver ticals of Siam.

The current pagoda of India is  $2\frac{1}{2}$  ticals, or 10 mayons ; and 4 pagodas make 1 gold tical of Siam.

The tical of gold, and that of silver, weigh  $5\frac{1}{2}$  pagodas each, corresponding with 281 $\frac{1}{2}$  grains troy weight. The purity of the former is of 79 $\frac{1}{2}$  touch, and that of the latter of 98.

The pic, commercial weight, consists of 100 cattis, 2000 tales, 8000 ticals, or 48000 pagodas.

The chi, measure for rice and grain, contains 40 sestres, or 1600 sats. A seste of rice weighs 100 cattis.

The can, or canan, liquid measure, is 4 leengs.

The roe-neug, long measure, is divided into 20 tods, 80 sen, 1600 voua, or 3200 ken ; and the voua into 2 ken, 4 sok, 8 keuh, or 96 doits. The doit is 8 grains of rice.



## SICILY.

At Palermo, Messina, and in the other parts of this island, accounts are kept in oncie, or ounces, each oncia consisting of 30 tari, and each taro of 20 grani. The oncia is also divided into  $2\frac{1}{2}$  scudi, 5 fiorini, 30 tari, 60 carlini, 450 ponti, 600 grani, 3600 piccioli.

The coins of Sicily are as follow :

Of gold : the oncia of 30 tari ; the double oncia of 60 tari.

Of silver : the scudo of 12 tari ; the  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{6}$ ,  $\frac{1}{12}$  of a scudo ; the carlino of 10 grani.

The Spanish hard dollar is current for 12 tari 12 grani.

Three weights are used in Sicily :

The rotolo grosso of  $2\frac{1}{4}$  pounds, or 33 ounces.

The rotolo sottile of  $2\frac{1}{2}$  pounds, or 30 ounces.

The pound of 12 ounces.

The cantaro peso grosso of 100 rotoli grossi, is equivalent to 110 rotoli sottili, or 275 pounds of Sicily.

The cantaro peso sottile of 100 rotoli sottili, corresponds with  $90\frac{10}{11}$  rotoli grossi, or 250 pounds of Sicily.

The salma generale, corn measure, is 16 tomoli ; and the salma grossa, for pulse, is 20 tomoli.

4 salme grosse make 5 salme generali.

A tonna of wine contains 12 salme.

The canna of Sicily is 8 palmi.

## SMYRNA.

Accounts are kept at Smyrna in piastres, each consisting of 40 paras.

The piastre is also divided into 80 great aspers, 100 cents, or 120 aspers.

The other coins are referred to under the head of Turkey.

The Imperial and Hungarian sequins are worth about  $8\frac{1}{2}$  piastres, the Venetian 10, and the Dutch  $9\frac{1}{2}$ .

The Imperial tallaro, or reichsthaler, and the Spanish hard dollar, are worth about 4 piastres each.

The cantaro, or quintal, consists of  $7\frac{1}{2}$  batmans,  $22\frac{1}{2}$  cheques, 45 okes, 100 rotolos, or 18000 drachms.

A quintal of cotton wool, and of tin, is only 44 okes.



The rotolo is 180 drachms; and the oke, which is 400 drachms, corresponds with  $2\frac{1}{4}$  pounds avoirdupois.

4 rotolos of Smyrna make 1 rotolo of Aleppo.

A chequee of 800 drachms of goats' wool generally renders at London  $5\frac{1}{2}$  pounds avoirdupois; a tefsee of 610 drachms of Brussa silk,  $2\frac{3}{4}$  pounds; a chequee of 250 drachms of opium,  $1\frac{1}{2}$  pound; a quintal of fruit of 100 rotolos, 1 hundred weight; and a quintal of cotton wool of 100 rotolos, 106 pounds.

Gold and silver lace is sold by the metical of  $1\frac{1}{2}$  drachm.

A fortin of wheat measures 4 quillots,  $4\frac{1}{2}$  of which make 1 charge of Marseilles.

The pike is  $\frac{3}{4}$  of an English yard.

### SPAIN.

In this extensive monarchy, accounts are generally kept in *reales*, each real consisting of 34 maravedis.

There are several sorts of reals, differing from each other either in name or in value.

The *real de vellon*, or real of silver and copper, is a  $\frac{1}{20}$ th part of a hard dollar, and worth  $8\frac{1}{2}$  quartos, or 34 maravedis of vellon. It is the most current coin in Spain.

The *real de plata provincial* is a  $\frac{1}{10}$ th part of a hard dollar, and worth 17 quartos, or 68 maravedis of vellon. This real is also denominated *real de plata nueva*, or real of new plate\*.

The *real de plata antigua*, or real of old plate, is worth 16 quartos, 34 maravedis of plate, or 64 maravedis of vellon. This real, 10 of which make a hard dollar, and 8 a dollar of exchange, is mostly used in respect to transactions with foreign countries.

The *real de plata Mexicana*, or Mexican real of plate, is a  $\frac{1}{8}$ th part of a hard dollar, and worth 34 Mexican maravedis of plate, or 85 maravedis of vellon.

There are four other sorts of reals, which are referred to under the heads of Alicante, Barcelona, and Valencia.

### *Monies of Exchange.*

The *doblon de plata 6 de cambio*, or pistole of exchange, is 32 reals of plate, 60 reals 8 maravedis of vellon, 1088 maravedis of plate, or 2048 maravedis of vellon.

\* The Spanish word *plata* means silver.



The *peso de plata ó de cambio*, or dollar of exchange, is one-fourth of a pistole, and worth 8 reals of plate, 15 reals 2 maravedis of vellon, 128 quartos, 272 maravedis of plate, or 512 maravedis of vellon.

The *ducado de plata ó de cambio*, or ducat of exchange, is worth 11 reals 1 maravedi of plate, 20 reals 25 $\frac{1}{4}$  maravedis of vellon, 375 maravedis of plate, 705 $\frac{1}{4}$  maravedis of vellon. The ducat is divided into 20 sueldos, and the sueldo into 12 dineros.

*Monies used in the Inland Trade.*

The *doblon de plata sensillo* is 60 reals, or 2040 maravedis of vellon.

The *peso sensillo*, or *peso provincial*, is 15 reals, or 510 maravedis of vellon.

The *ducado de vellon* is 11 reals, or 374 maravedis of vellon.

The coins of Spain are as follow :

|                                                                     | Vellon. |      |
|---------------------------------------------------------------------|---------|------|
|                                                                     | Reals.  | Mrs. |
| Of gold: the doblon de á 8 escudos, or <i>doubloon</i> , is . . . . | 320     | —    |
| the medio doblon, or doblon de á 4 . . . . .                        | 160     | —    |
| the doblon de oro efectivo, or <i>pistole</i> . . . . .             | 80      | —    |
| the escudo de oro efectivo . . . . .                                | 40      | —    |
| the escudito, or coronilla neuva . . . . .                          | 20      | —    |
| Of silver: the peso duro, or <i>hard dollar</i> . . . . .           | 20      | —    |
| the escudo de vellon, or $\frac{1}{2}$ peso . . . . .               | 10      | —    |
| the peseta Mexicana, or $\frac{1}{4}$ ditto . . . . .               | 5       | —    |
| the real de plata Mexicana . . . . .                                | 2       | 17   |
| Of silver and copper: the peseta provincial . . . . .               | 4       | —    |
| the real de plata provincial . . . . .                              | 2       | —    |
| the real of vellon . . . . .                                        | 1       | —    |
| Of copper: the pieza de 2 quartos . . . . .                         | 0       | 8    |
| the quarto . . . . .                                                | 0       | 4    |
| the ochavo . . . . .                                                | 0       | 2    |

The gold coins abovementioned are of the new coinage of 1772. Those of the former coinage which still remain in circulation bear a premium: 10 quartos, or 40 maravedis, are allowed upon a doblon de á 8 escudos, and a proportionate premium upon the others.

The *marco Castellano*, or marc of Castille, for weighing gold, consists of 8 onzas, 50 castellanos, 64 ochayas, 128 adarmes, 400 tomines, or 4800 granos.



The same marc, for weighing silver, is composed of 8 onzas, 50 castellanos, 64 ochavas, 128 adarmes, 384 tomines, or 4608 granos.

In the assaying of gold, the castellano is divided into 24 quilates, or carats; the carat into 4 grains, and the grain into 8 parts.

In the assaying of silver, the marc is divided into 12 dineros, or pennyweights, and the pennyweight into 24 grains.

The coinage of gold and silver is regulated since the year 1772 as follows:

A marc of gold of the purity of  $21\frac{3}{4}$  carats, inclusive of 2 tomines for the remedy of the weight, and of  $\frac{1}{12}$  carat for the remedy of the alloy, is coined into  $8\frac{1}{2}$  doblones de á 8, 17 doblones de á 4, 34 doblones efectivos, or 68 escudos efectivos.

A marc of silver of the purity of  $10\frac{3}{4}$  pennyweights, inclusive of 2 tomines for the remedy of the weight, and of 1 grain for the remedy of the alloy, is coined into  $8\frac{1}{2}$  pesos duros, 17 medios pesos, 34 pesetas Mexicanas, or 68 reales de plata Mexicana.

The proportion between gold and silver in Spain is as 1 to 16.

The marc of Castille is used by the apothecaries, and divided into 8 onzas, 64 dracmas, 192 escrúpulos, 384 obolos, 1152 caractères, or 4608 granos.

The onza, or ounce, for weighing jewels, consists of 140 quilates, or carats; and the carat of 4 grains is equal to 4 of the grains used in respect to the marc silver weight.

The libra, or pound, commercial weight, is divided into 2 marcs of Castille, 16 ounces, or 9216 grains.

The quintal consists of 4 arrobas, or 100 pounds of Castille, and the arroba of 25 pounds.

The cahiz, corn measure, contains 12 fanegas, 48 quartillas, or 144 celemines.

The fanega is 12 celemines, and measures  $4322\frac{1}{2}$  cubic inches of Burgos: the celemin is divided into 2, 4, 8, 16, 32, or 64 parts.

A moyo of wine is composed of 16 cantaras, or 128 azumbres.

The cantara, or arroba, is 8 azumbres, or 32 quartillos.

The quartillo contains 17 Castille ounces of river water, and measures  $38\frac{3}{4}$  cubic inches of Burgos.

An arroba of oil weighs 25 pounds of Castille of the same liquid, and is divided into 2 medias arrobas, 4 quartillos, 25 libras, or 100 quarterones or panillas.



The vara, cloth measure, is 3 feet, 4 palmos, 36 inches, 48 *dedos*, or finger's breadth, or 432 lines. It is also divided into 3, 6, 8, or 16 parts.

The codo, for measuring timber and masts, is  $\frac{2}{3}$  of the vara, or 2 feet, and consists of 8 palmos de Ribera.

The *estado*, *braza*, *toesa*, or fathom, is 6 feet.

The *pie Burgales*, or foot of Burgos, is divided into 12 *pulgadas*, or inches, and the inch into 12 *lineas*, or lines.

The cuerda is 33 palmos de vara, or 99 palmos de Ribera.

The yugada, land measure, is composed of 50 fanegadas, each of which is generally reckoned 400 *estadales*: the *estadal* is 12 feet.

The aranzada, for measuring vineyards, is  $73\frac{1}{4}$  varas.

144 aranzadas make 121 fanegadas.

Since the year 1766, the *legua*, or league of Castille, is 8000 varas, or 24000 feet of Burgos.

The *legua juridica* is 5000 varas, and is divided into 3 millas or miles, the milla into 8 *estadios*, and the *estadio* into 125 *pasos* of 5 feet each.

The *legua maritima*, or marine league, is  $6666\frac{2}{3}$  varas.

20 marine leagues, or 60 miles of Spain, make 1 degree.

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#### STETTIN.

In this city, the capital of Prussian Pomerania, accounts are kept in thalers, or rixdollars, each consisting of 24 gute groschen, and each gute groschen of 12 fierkens currency.

The thaler is also divided into  $1\frac{1}{2}$  gulden, 24 gute groschen, 36 schillings, 72 schilling-sundisch, 96 dreyers, 144 wittens, or 288 fierkens.

The other coins, described under the head of Berlin, are current at Stettin.

The schifpfund, commercial weight, is  $2\frac{1}{2}$  centners, 20 lispfunds, or 280 pounds.

The centner is 112 pounds, and the lispfund 14.

The stein, or stone of wool, is 21 pounds; and the light stone 10.

A last of corn is 4 wispels, 8 drœmts, 96 scheffels, or 1536 metzens, and measures about  $14\frac{1}{2}$  Winchester quarters.



1 chaldron of coals, Newcastle measure, renders  $34\frac{1}{2}$  bergscheffels, 1 of which is equal to  $1\frac{1}{2}$  scheffel of Berlin.

An anker of wine is 52 noëssels.

Cloth is measured by the ell.

The course of exchange is as follows:

Amsterdam receives 142 current rixdollars, more or less, for 100 rixdollars banco.

Hamburg receives 151 current rixdollars, more or less, for 100 rixdollars banco.

London receives 6 rixdollars 3 gute groschen currency, more or less, per pound sterling.

#### STRALSUND.

In this city, the capital of Swedish Pomerania, accounts are kept either in thalers, or rixdollars, each consisting of 48 schillings, and each schilling of 12 pfenings; or in Pommersche-guldens of 24 schillings, each of 12 pfenings.

The thaler is also divided into 2 guldens of Pomerania, 6 marcs, 24 groschen, 48 schillings, 96 sechslings, 192 wittens, or 576 pfenings.

The coins in circulation are as follow:

Of gold: the Adolphus of 5 thalers.

Of silver: pieces of 16, 8, 4, 2, 1, and  $\frac{1}{2}$  groschen.

The schifpfund, commercial weight, consists of  $2\frac{1}{2}$  centners, 20 lispfunds, or 280 pounds.

The centner is 112 pounds; the lispfund 14; and the stein of wool 10.

The grocers and retailers make use of another weight, which is  $3\frac{1}{2}$  per cent lighter, and is equal to that of Cologne.

A last of corn contains 8 droemts, 32 tonnes, 96 scheffels, 384 fehrtts, or 1586 metzers.

The last of wheat renders about  $14\frac{3}{4}$  Winchester quarters, and that of oats about  $15\frac{1}{4}$ .

The stubgen, liquid measure, contains 4 pottles of Stralsund.

Cloth is measured by the ell.

The course of exchange is as follows:

Amsterdam receives 140 current rixdollars, more or less, for 100 rixdollars banco.



Hamburg receives 148 current rixdollars, more or less, for 100 rixdollars banco.

Stockholm receives 133 current rixdollars, more or less, for 100 rixdollars new coinage.

#### STRASBURG.

Accounts are kept in this city in francs and cents.

The coins circulating at Strasburg are referred to under the head of France.

The commercial weight is the poids de marc; the retailers make use of another weight which is 4 per cent lighter.

A sester, or setier of corn, is 4 vierlings, or 16 massels.

The fuder, liquid measure, contains 24 ohms, 576 maas; and the maas, or pot, is 4 schoppen, or chopines.

Cloth is measured by the Paris ell, or by the brâche of Strasburg.

43 Paris ells make 95 Strasburg braches.

#### SURAT.

In this city of Hindoostan, in the Province of Guzerat, in India, accounts are kept in rupees, each consisting of 16 annas, or 32 pennes.

The coins of Surat are as follow:

Of gold: the rupee of 4 pagodas, or 14 silver rupees; the pagoda of  $3\frac{1}{2}$  silver rupees.

Of silver: the rupee; the half and quarter rupee; the mamudi,  $2\frac{1}{2}$  of which make generally 1 silver rupee.

Of copper: the pacha of 68 padens.

The tola, for weighing gold and silver, consists of 32 vales, 96 ruttes, or 576 chonvels.

The candy, commercial weight, is composed of 20 maunds; the maund of 40 seers; and the seer of 30 pice.

The Surat maund of 40 seers is equivalent to 37 pounds  $7\frac{3}{8}$  ounces avoirdupois. The maund is, however, sometimes composed of a greater number of seers, from 41 up to 46; and the candy is also not uniformly confined to 20 maunds.

For instance, pepper and sandal wood are sold by the Bombay



candy of 21 maunds ; and cotton, the great staple commodity of the Surat market, is sold by the Surat candy of 21 maunds.

The guz, long measure, is 28 inches ; the cobit, or cubit, 18.

9 guz make 14 cubits.

The English yard is in common use for European goods.

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SURINAM.

Accounts are kept at Surinam, Demerary, Isequibo, and Paramariba, in guldens, or florins, each gulden consisting of 20 stuyvers, and each stuyver of 16 penningen.

All the Dutch coins are current in those settlements, bearing an augmentation of 20 per cent in their value.

|                                            | Florins. | Stivers. |
|--------------------------------------------|----------|----------|
| The ryder..of 14 florins of Holland, is    | 16       | 16       |
| The ducat..of $5\frac{1}{4}$ ditto.....    | 6        | 6        |
| The piece..of 3 ditto .....                | 3        | 12       |
| The rixdaler of $2\frac{1}{2}$ ditto ..... | 3        | 0        |
| The florin.....                            | 1        | 4        |

And the other Dutch coins in the same proportion.

The weights and measures are referred to under the head of Amsterdam.

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SWEDEN.

Accounts are kept in this kingdom in riksdahlers, or rixdollars, each consisting of 48 skillings, and each skilling of 12 oeres, or pfenings.

The riksdahler is divided into 6 silver dahlers, 18 copper dahlers, 24 silver marcs, 72 copper marcs, 192 silver oeres, 576 copper oeres, 768 silver oerleins, or 2304 copper oerleins.

All the monies of Sweden are distinguished by the names of *silfver-mynt* and *kopper-mynt*, or silver money and copper money. The value of the former is three times that of the latter.

The coins of Sweden are as follow :

Of gold : the Swedish ducat, which, as well as that of Holland, is worth 1 riksdahler 46 skillings.

Of silver : the riksdahler of 6 silver dahlers, 18 copper dahlers, or 48 skillings ; the  $\frac{2}{3}$ ,  $\frac{1}{3}$ ,  $\frac{1}{6}$ ,  $\frac{1}{12}$ , and  $\frac{1}{24}$  of a riksdahler, of proportionate value.

Of copper : pieces of 12, 9, 6,  $4\frac{1}{2}$ , 3,  $2\frac{1}{2}$ , and  $1\frac{1}{2}$  copper dahler ;



and pieces of 6 and 3 copper oeres; the rundstyeke of 1 copper oere; and the  $\frac{1}{2}$  rundstyeke.

The coinage of these monies is regulated as follows;

$60\frac{1}{2}$  ducats are struck from a marc of gold of the purity of 23 carats 5 grains.

$7\frac{1}{2}$  riksdahlers are struck from a marc of silver of the purity of 14 lods 1 grain.

540 dahlers in plates of copper, worth from  $1\frac{1}{2}$  dahler to 12 dahlers each, and 900 dahlers in pieces, worth from  $\frac{1}{2}$  oere to 6 oeres each, are struck from a skippund, victualie weight, of pure copper.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains; and in the assaying of silver, into 16 lods, the lod into 18 grains.

The marc, for weighing gold and silver in bars, consists of 16 lods, 64 quintins, or 4384 as, and corresponds with  $3251\frac{1}{2}$  grains troy weight.

The pile of 32 ducats, used for weighing ducats, is equivalent to  $1721\frac{1}{2}$  grains troy weight.

The pound, apothecaries weight, corresponds with 5501 grains troy weight.

Four weights are used in Sweden, in respect to the sale of merchandize.

The pound *victualie-wigt*, or weight for provisions, consists, according to the statutes, of 8848 as, and corresponds with 6563 grains troy weight.

The mark, *berg-werk-wigt*, or miners' weight, consists of  $7821\frac{7}{12}$  as, and is equivalent to  $5801\frac{1}{2}$  grains troy weight.

The mark, *land-staten-wigt*, or country and city weight, consists of  $7450\frac{2}{3}$  as, and is equivalent to 5526 grains troy weight.

The mark, *yern-wigt*, or *stapelstad-wigt*, for weighing iron, and goods in *entrepôt*, consists of  $7078\frac{2}{3}$  as, and is equivalent to  $5250\frac{1}{2}$  grains troy weight.

The skippund is composed of 20 lispunds, or 400 pounds, victualie wigt, and serves for weighing almost every description of goods.

The centner is 120 pounds; the waag 165; the sten 32; and the lispund 20.

The pound victualie-wigt is divided into 32 lods, the lod into 4 quintins, and the quintin into  $69\frac{1}{2}$  as.



The as of Sweden is the same as that of Holland.

The tunna, corn measure, is composed of 2 spanns, 8 ferdings, 32 kappes, 56 kannas, 112 stops, 448 quarters, or 1792 jungfres.

In measuring, 4 kappes are allowed to a tunna of wheat, rye, barley, oats, and pease; 6 kappes to a tunna of malt; and 2 kappes to a tunna of salt.

The tunna measures  $5\frac{1}{3}$  cubic feet of Sweden.

The fuder is composed of 2 pypen, 4 oxhufs, 6 ahms, 12 ambares, 24 ankars, 360 kannas, 720 stops, 2880 quarters, or 11520 jungfres.

The kanna measures  $172\frac{1}{2}$  cubic inches of Sweden.

The mil, or mile, is reckoned 18000 Swedish ells.

The ruthe is 8 ells, 16 feet, or 192 inches.

The faum, or fathom, is 3 ells, or 6 feet.

The allen, or ell, is 2 feet, or 24 inches.

The fotz, or foot, is 12 inches, or 144 lines.

#### TOULON.

Accounts are kept in this sea-port of France in francs and cents.

The pound of Toulon is 14 per cent less than the pound poids de marc.

The charge, corn measure, is 3 setiers, or  $4\frac{1}{2}$  émines.

100 émines of Toulon make 105 émines of Marseilles.

The millerolle, liquid measure, is 4 escandeaux. It contains 130 pounds of river water poids de marc, and measures 17 gallons of London, or 68 pintes of Paris.

The other measures are referred to under the head of Marseilles.

#### TRIESTE.

In this free port of Carniola, situated on a Gulph collateral to the Gulph of Venice, accounts are kept in fiorini, or guldens, each fiorine consisting of 60 crazie, or cruitzers, currency.

The fiorine is 5 lire, 60 crazie, 100 soldi, or 240 denari.

The lira is divided into 20 soldi, and the soldo into 12 denari.

The coins circulating at Trieste are as follow:

Of gold: the Imperial zecchino, worth about  $6\frac{1}{4}$  fiorini; and the Venetian about  $6\frac{2}{3}$ .



Of silver: the talaro, or reichsthaler especie de convencion, worth about  $2\frac{2}{3}$  fiorini; and the Spanish dollar  $2\frac{3}{4}$ .

The pound, or pfund of Vienna, the libbra grossa, and the libbra sottile of Venice, are used at Trieste for weighing the several descriptions of goods.

100 pounds of Vienna make  $117\frac{1}{2}$  pounds Venetian great weight, and 185 pounds Venetian small weight.

The staro veneto, corn measure, consists of 3 pollonicky.

100 stara correspond with 50 charges of Marseilles, 114 sacchi of Leghorn, and 70 emine of Genoa.

An orna of oil is composed of 36 boccali, and weighs 107 pounds of Vienna.

Brandy is sold by the barile of 46 boccali.

A barrel of wine is 18 gallons English.

Cloth is measured by the braccio.

#### TRIPOLI.

In this State, upon the coast of Barbary, in Africa, accounts are kept in piastres, each consisting of 13 grimellins, or 52 aspers.

The value of the foreign coins circulating at Tripoli varies according to their weight and standard.

Gold and silver, either in bars or in coins, are weighed by the metecalo, 50 of which correspond with the Venetian marc, which is equivalent to  $3686\frac{1}{3}$  grains troy weight.

The cantaro, commercial weight, consists of 100 rotolos, the rotolo of 16 ounces, and the ounce of 8 termines.

The caffiso, corn measure, is 20 tiberi.

A mataro of oil weighs 42 rotolos.

7 matari of Tripoli make 10 miri of Venice.

Cloth is measured by the pike, which is  $2\frac{1}{2}$  palmi of Genoa.

#### TUNIS.

In this State of Barbary, in Africa, accounts are kept in piastres, each consisting of 52 aspers, and each asper of 12 burboes.

The maboob, or sequin, is  $4\frac{1}{2}$  piastres; the piastre 16 caroobs; and the caroob  $3\frac{1}{4}$  aspers.

Precious metals and jewels are weighed by the ounce consisting of 8 termines, and equivalent to  $1\frac{1}{2}$  oncia peso sottile of Venice.



The cantaro, commercial weight, consists of 100 rotolos, or 1600 ounces.

A caffise of corn contains 16 tumulos, and a tumulo of good wheat weighs about 50 pounds of Tunis.

A mataro of oil contains 2 mataros of wine; it weighs 32 rotolos, and corresponds with 5 gallons English.

Several sorts of pikes are used.

45 pikes cloth measure make 48 pikes measure for silk stuffs, or 64 pikes linen measure.

### TURIN.

Accounts are kept at Turin, and in the other cities of Piedmont, in lire, each lira consisting of 20 soldi, and each soldo of 12 denari.

The coins of Piedmont are as follow :

|                                           | Weight.                     | Value.                |
|-------------------------------------------|-----------------------------|-----------------------|
| Of gold : the old pistole, or doppia..... | 125 $\frac{1}{3}$ grains .. | 16 $\frac{3}{8}$ lire |
| that of 1741 and 1742 .....               | 134 $\frac{1}{2}$ ditto ..  | 18 do.                |
| the zecchino of 1744 .....                | 65 ditto ..                 | 9 $\frac{1}{4}$ do.   |
| the new pistole, or doppia, 1755 .....    |                             | 24 do.                |
| Of silver : the old escudo .....          | 21 denari ..                | 4 $\frac{1}{2}$ do.   |
| the escudo of 1733 and 1735 .             | 23 $\frac{1}{8}$ ditto ..   | 5 do.                 |
| the new escudo of 1755 .....              |                             | 6 do.                 |
| the ducaton .....                         | 24 $\frac{5}{6}$ ditto ..   | 5 $\frac{1}{2}$ do.   |

The marc, for weighing gold and silver, consists of 8 ounces, the ounce of 24 denari, the denaro of 24 grani, and the grano of 24 granotini.

In the assaying of gold, the ounce is divided into 24 carats, the carat into 24 denari, and the denaro into 24 grani.

In the assaying of silver, the ounce is divided into 12 denari, and the denaro into 24 grani.

The new pistole, or doppia of Piedmont, weighs 7 denari 12 grani 6 granotini of gold, of the purity of 21 $\frac{1}{2}$  carats.

The new escudo weighs 27 denari 10 grani 23 $\frac{1}{8}$  granotini of silver, of the purity of 10 $\frac{7}{8}$  denari.

The proportion between gold and silver is as 1 to 14 $\frac{3}{4}$ .

The pound, apothecaries weight, is composed of 12 ounces, the ounce of 8 drachms, the drachm of 3 scruples, or 60 grains.

The pound, commercial weight, consists of 12 ounces; the ounce of 8 ottavi; and the ottavo of 3 denari, or 72 grani.



The carat, for weighing diamonds, is divided into 4 grains, equal to those into which the marc is subdivided.

The rubbo is 25 pounds, or  $37\frac{1}{2}$  marcs.

The emine, corn measure, contains 2 quartere, or 16 copelle.

The brenta, liquid measure, is 36 pinti, 72 boccali, or 144 quartini.

Cloth is measured by the raso.

### TURKEY.

Accounts are kept in Turkey in piastres, each piastre being divided either into 40 paras, 80 great aspers, 100 parts called mines or medines, or 120 aspers.

The coins of Turkey, struck at Constantinople, are as follow :

Of gold : the sultanin, or sequin foundouckly, of 4 piastres, and which is current for 5 ; the sequin zeramabouc, or zermahboub, of 3 piastres ; the half zermahboub, or nisbie, of 1 piastre 20 paras ; the roubbie of 1 piastre. The value of these coins is exclusive of a variable agio.

Of silver : the allmichlec of 60 paras ; the grouch, or piastre, of 40 paras ; the zolotta of 30 paras ; the roubb of 10 paras ; and the para.

The coinage in Turkey has experienced repeated alterations, both in respect to the weight and to the standard of the several coins.

In 1780, Abdoul-Hamet ordered that the weight of the *chise*, or purse, should be  $2812\frac{1}{2}$  drachms ; and as the purse consists of 500 piastres of the purity of 50 carats each, the piastre weighs  $5\frac{1}{2}$  drachms.

100 zermahboub, 200 nisbies, or 300 roubbies, should weigh  $82\frac{1}{2}$  drachms, of the purity of  $19\frac{1}{4}$  carats.

The *cheky*, or pound, for weighing precious metals, consists of 100 drachms, 1600 carats, or 6400 grains.

In the assaying of gold, the unit of reference is divided into 24 carats, the carat into 4 grains ; and in the assaying of silver, into 100 carats, the carat into 4 grains.

The cantaar, commercial weight, is divided into  $7\frac{1}{2}$  batmans, 44 okes, 100 rotolos, 176 yusdromes, or chekis ; and the cheky into  $66\frac{2}{3}$  miscals, or 100 drachms.



A kilò, or kisloz of wheat, weighs about 22 okes; and 4 kisloz make 1 fortin.

The meter and the alme are used for measuring liquids.

Cloths are measured by the great pike; and cotton goods by the pike, or pik belledy.

### VALENCIA.

In the titular kingdom of Valencia, in Spain, accounts are kept in *libras*, each libra consisting of 20 sueldos, and each sueldo of 12 dineros; or otherwise in *reales de plata nueva*, or reals of new plate, of 24 dineros each.

The libra of Valencia is equal to the peso de cambio, or dollar of exchange.

The real of new plate, 10 of which compose the libra, is worth 2 sueldos, or 24 dineros of Valencia, and is equal to  $12\frac{1}{2}$  quartos, or  $51\frac{1}{2}$  maravedis of vellon.

The real of old plate, 8 of which compose the libra, is worth  $2\frac{1}{2}$  sueldos, or 30 dineros of Valencia.

The *real de plata Valenciana*,  $13\frac{1}{2}$  of which compose the libra, is worth  $1\frac{1}{2}$  sueldo or 18 dineros of Valencia, and is equal to  $9\frac{1}{2}$  quartos, or  $38\frac{2}{3}$  maravedis of vellon.

The value of the Spanish coins at Valencia is as follows:

The *doblon de á 8 escudos*, or doubloon, is  $21\frac{1}{2}$  libras, and the other *doblones* in the same proportion.

The *peso duro*, or hard dollar, 1 libra  $6\frac{2}{5}$  sueldos.

The real of vellon  $1\frac{2}{3}$  sueldo, or  $15\frac{1}{6}$  dineros.

The pistole of exchange 4 libras.

The ducat of exchange 1 libra  $7\frac{1}{2}$  sueldos.

The proportion between these monies is as follows:

272 ducats of exchange .. 375 libras of Valencia

136 ditto ..... 1875 reals of new plate

32 hard dollars ..... 425 ditto

4 reals of old plate .... 5 ditto.

The marc, for weighing gold and silver, is subdivided into 8 onzas, 32 quartos, 128 adarmes, or 4608 grains.

31 marcs of Valencia make 32 marcs of Castille.

The quintal *peso sutil* is composed of 4 arrobas, or 120 pounds; the arroba of 30 pounds; and the pound, or *libra pensil*, of 12 ounces. This pound is used for weighing bread, sugar, tobacco, and groceries.



The arroba of flour consists of 32 pounds of 12 ounces each.

The pound of fresh fish is 16 ounces, of salt fish 18, and of meat 36.

The quintal *peso grueso* is composed of 4 arrobas, or 144 pounds; the arroba of 36 pounds; and the pound of 12 ounces. This quintal is generally used at Valencia.

31 ounces of Valencia make 32 ounces of Castille.

The cahiz, corn measure, contains 12 barchillas, or 48 celemines, and the celemin is divided into 4 quarterones.

13 cahizes of Valencia make 48 fanegas of Castille.

A cantaro, liquid measure, is 4 azumbres, and weighs 36 pounds of 12 ounces each.

100 azumbres of Valencia make 164 azumbres of Castille.

The vara of Valencia consists of 3 feet, or 4 palmos; and the palmo of 4 quartos, or 12 dedos.

12 varas of Valencia make 13 varas of Castille.

The yugada, land measure, is 6 cahizadas, the cahizada is 6 fanegadas, and the fanegada 200 brazas quadradas.

The cuerda is 20 brazas, or 45 varas, and the braza 9 palmos.

100 cahizadas of Valencia make  $137\frac{1}{2}$  fanegadas of Castille.

#### VENICE.

Accounts are kept at Venice either in lire, each lira consisting of 20 soldi, and each soldo of 12 denari di lira; or in ducati, each ducato being divided into 24 grossi, and each grosso into 12 denari di ducato, or grosseti.

The ducato is  $6\frac{1}{2}$  lire, 24 grossi, 124 soldi, or marchetti, 288 grosseti, or 1488 denari di lira.

|                  |               |
|------------------|---------------|
| 5 ducati make... | 31 lire       |
| 31 lire .....    | 120 grossi    |
| 6 grossi .....   | 31 marchetti. |

These monies have the several denominations of banco valuta, corrente valuta, and moneta corrente piccola.

The *banco valuta*, or bank value, is 20 per cent better than the current value.

The *corrente valuta* was the current value of the Venetian coins between the years 1686 and 1750. The doppia was then worth 29 lire, the zecchino 17, the scudo della croce  $9\frac{1}{2}$ , the ducatone or giustina  $8\frac{1}{2}$ , and the ducato effettivo  $6\frac{1}{2}$ .



The *moneta corrente piccola*, or small currency, is the effective currency. Before the year 1750, an agio of 20 per cent was added to the ducati di banco, to bring them into ducati corrente valuta; and then a *sopra agio* of 29 per cent was added to the latter, to bring them into ducati corrente piccoli. In the year 1750, the Government fixed the value of the bank ducat at 9 lire 12 soldi corrente piccoli, by which the difference between bank value and small currency became  $54\frac{3}{4}$  per cent, or  $54\frac{1}{2}$ , as it is reckoned in business.

31 ducati di banco make 48 ducati corrente piccoli  
 31 lire ditto ..... 48 lire ditto.

The Bank of Venice keeps its accounts in lire grosse, each lira grossa consisting of 20 soldi grossi, and each soldo grosso of 12 denari grossi. The lira grossa is 10 ducati, or 62 lire di banco.

The coins of the Republic of Venice are as follow:

Of gold: the doppia of 37 lire 10 soldi; the zecchino, or sequin, of 22 lire.

Of silver: the scudo veneto, or della croce, of 12 lire 8 soldi; the half and quarter scudo of proportionate value; the ducatone or giustina of 11 lire; the ducato effettivo of 8 lire; the half and quarter ducato of proportionate value.

Of silver and copper: the osello of 3 lire 18 soldi; the lirazza of  $1\frac{1}{2}$  lira; the lira; pieces of 15, 10, and 5 soldi.

Of copper: the soldo and the  $\frac{1}{2}$  soldo, or bagattino.

The value of these coins is in moneta corrente piccola, but it is subject to an agio which varies according to circumstances. The agio on the sequins, in the month of February 1805, was at 37 per cent.

The marc, for weighing precious metals, consists of 8 oncie, 32 quarti, 1152 carati, or 4608 grani.

In the assaying of gold and silver, the unit of reference is divided into 1152 carati.

Gold and silver in bars are sold by the ounce fine, for so many lire correnti piccole.

The coinage at Venice is regulated as follows:

A marc of fine gold is coined into  $68\frac{1}{2}$  zecchini.

The same marc, according to Kruse, Ricard, and Marien, was coined into  $35\frac{1}{2}$  doppie, which, however, is necessarily erroneous



in respect to the comparative current value of the doppia and of the zecchino.

The scudo della croce, or Venetian *dollar*, weighs  $1\frac{1}{8}$  ounce of the purity of 1056 carati, or  $\frac{1}{12}$  fine.

The ducatone, or ducatoon, weighs 3 quarti  $27\frac{1}{2}$  carati of the same purity as the scudo.

The ducato effettivo, or effective ducat, weighs 3 quarti  $1\frac{3}{4}$  carato of the purity of 952 carati, or 9 ounces 18 pennyweights.

The apothecaries make use of the same weight as that which is in general common to Germany, and which is referred to under the head of Hamburg.

Two weights are used at Venice: the peso grosso, or great weight; and the peso sottile, or small weight.

100 pounds peso grosso make 158 pounds peso sottile.

The carica is composed of 4 quintals, and the quintal of 100 pounds small weight.

The pound small weight consists of 12 ounces, 72 saggi, or 1728 carati.

A staro, or stajo of wheat, is 4 quarti, and weighs about 132 pounds great weight.

A migliajo of oil is 40 miri.

The amphora, liquid measure, consists of 2 bigoncie, 4 mastelli, 8 quartari, 32 secchie, or 512 engistari.

The long measure is the braccio.

16 brachi cloth measure make 17 brachi silk stuffs measure.

N. B. The preceding description is exclusive of the alterations which may have taken place since the fall of the Republic of Venice.

#### VERONA.

Accounts are kept in this city of Italy in lire, each lira consisting of 20 soldi, and each soldo of 12 denari moneta corrente piccola of Venice.

Two weights are used at Verona, the peso grosso and the peso sottile; the former of which is  $49\frac{1}{2}$  per cent heavier than the latter.

A minella of wheat weighs about 60 pounds Venetian great weight.



A brenta of wine contains 8 bassi.

A migliajo of oil measures 40 miri, and weighs 1738 pounds peso sottile of Verona.

The same migliajo contains 8 brente 11 bassi, or 139 bassi; wherefore the miro is  $3\frac{1}{2}$  bassi.

The braccio of Verona is the same as that used at Venice for silk stuffs.

#### VIENNA.

In this city, the capital of Austria, accounts are kept in gulden, each gulden consisting of 60 kreutzers, or cruitzers, and each kreutzer of 4 pfenings.

The specie reichsthaler is  $1\frac{1}{2}$  thaler, 2 gulden, or 120 kreutzers.

The current thaler, or rixdollar, is  $1\frac{1}{2}$  gulden, or 90 kreutzers.

The gulden is divided into 8 schillings, 20 groschen, 60 kreutzers, 80 gröschels, 240 pfenings, or 480 hellers.

The coins of Austria are as follow :

Of gold : the double souverain of  $12\frac{2}{3}$  gulden, and the souverain of  $6\frac{1}{3}$ ; the Imperial ducat of 4 gulden 30 kreutzers.

Of silver : the specie reichsthaler of 2 gulden; and the gulden of 60 kreutzers.

Of silver and copper : pieces of 20, 17, 10, 7, 3, and  $1\frac{1}{2}$  kreutzer.

Of copper : the kreutzer, the gröschel, the half kreutzer, and the pfening.

The pieces of silver and copper are generally reckoned by quantities denominated *wurfe*.

12 wurfe of 17 kreutzer-pieces make 17 gulden

12 wurfe of 7 ditto ..... 7 ditto.

The marc, for weighing gold and silver, consists of 16 loths, 64 quintels, or 256 pfenings.

In the assaying of gold, the marc is divided into 24 carats, the carat into 12 grains; and in the assaying of silver, into 16 loths; the loth into 18 pfenings.

The abovementioned Austrian coins are of the coinage of 1753, and are denominated convention-money, to distinguish them from former coins as regulated by the constitution of the Empire.

Their weight and standard are as follow :



A marc of gold, Vienna weight, of the purity of 23 carats 8 grains, is coined into 80 $\frac{2}{3}$  ducats; and as 5 marcs of Vienna make 6 marks of Cologne, each ducat corresponds in weight with the ducat of Hamburg.

10 reichsthalers, 20 guldens, or 40 half guldens, are struck from a marc of silver of the purity of 13 $\frac{1}{3}$  loths:

|                  |                                    |                 |            |
|------------------|------------------------------------|-----------------|------------|
| 42               | pieces of 20 kreutzers from a marc | 9 $\frac{1}{3}$ | loths fine |
| 46               | ditto of 17 ditto..... ditto....   | 8 $\frac{1}{3}$ | ditto      |
| 72               | ditto of 10 ditto..... ditto....   | 8               | ditto      |
| 86 $\frac{1}{2}$ | ditto of 7 ditto..... ditto....    | 6 $\frac{1}{3}$ | ditto.     |

The saum, commercial weight, is composed of 275 pounds, the centner of 100, and the stein of 20.

The pfund, or pound, is divided into 2 marcs, or 4 viertings.

A muth of corn consists of 30 metzen, 120 viertels, or 240 achtels.

The fuder, or tun, liquid measure, contains 32 eimers, 128 viertels, 1280 maas or achtrings, 2240 kœpfen, or 5376 seidels.

The dreyling is only 30 eimers.

The klafter, or fathom, is 3 ells, or 6 feet of Vienna.

The joch, land measure, is 1600 square klafters.

#### ULM.

In this city of the Circle of Suabia, in Germany, accounts are kept in guldens, each gulden consisting of 60 kreutzers, and each kreutzer of 4 pfenings, or 8 hellers.

The thaler is 1 $\frac{1}{2}$  gulden, 22 $\frac{1}{2}$  batzen, 30 groschen, 90 kreutzers, 360 pfenings, or 720 hellers.

The price of wine is regulated by guldens consisting of 35 schillings each, the schilling being divided into 6 pfenings, or 12 hellers. The batzen is likewise reckoned 14 pfenings, or 28 hellers.

The other coins are referred to under the head of Augsburg.

The centner is composed of 100 pounds.

The immi, corn measure, contains 4 mittlen, 24 metzen, or 96 viertelein.

A fuder of wine measures 12 eimers.

The ruthe, land measure, is 12 feet, or 144 inches, and the inch is 12 scrupels.

Cloth is measured by the elle.



UNITED STATES OF AMERICA.

Accounts are kept in dollars, each dollar consisting of 100 cents; or otherwise in pounds currency, each pound consisting of 20 shillings, and each shilling of 12 pence currency.

The coins of the United States, by the statutes of the 8th August 1786, and 6th July 1787, were established as follow:

Of gold: the eagle of the purity of 22 carats, weighing 268,656 grains troy weight, or 246,268 grains pure gold, and worth 10 dollars; the half and quarter eagle in the same proportion.

Of silver: the dollar of the purity of 11 ounces, weighing 409,79 grains troy weight, or 375,64 grains pure silver, and worth 100 cents; the half and quarter dollar in the same proportion; as well as the disme, or a  $\frac{1}{10}$ th part of a dollar.

Of copper: 100 cents, or 200 half cents, to weigh  $2\frac{1}{4}$  pounds avoirdupois of copper.

The proportion between gold and silver is as 1 to 15 $\frac{1}{4}$ .

The weights and measures are the same as those described under the head of England.

WIRTEMBERG.

In this Electorate of Germany, accounts are kept in gulden, each gulden consisting of 28 schillings, and each schilling of 12 pfenings currency.

The thaler is  $1\frac{1}{2}$  gulden,  $2\frac{1}{2}$  pfunds,  $22\frac{1}{2}$  batzes, 42 schillings, 90 kreutzers, or 252 pfenings.

The coins of gold are the carolin, the ducat, and the reichs gulden; of silver, the reichsthaler and the gulden.

A scheffel of corn measures 8 simri, 32 vierlings or unzen, or 256 achtels.

A fuder of wine is 6 ahms, 96 immi or yunen, 960 maas, or 3840 schoppen.

Cloth is measured by the ell.



## WISMAR.

In this city of the Dutchy of Mecklenburg, accounts are kept in thalers of 48 schillings, each schilling of 12 pfenings.

The thaler is 2 guldens, 3 marken, 24 groschen, 48 schillings, 192 wittens, or 576 pfenings.

The schiffpfund consists of 20 lispfunds, or 320 pounds.

A schiffpfund of iron and lead is 280 pounds; a stein of flax 20, and of wool and feathers 10.

The pound is 32 loths, or 128 quintins.

The last of Wismar is 8 drœemts, or 96 scheffels.

The ell, cloth measure, is 2 feet.

## ZELL.

In this city of the Dutchy of Lunenburg, in Germany, accounts are kept in thalers, each consisting of 36 marien groschen, and the marien groschen of 8 pfenings.

The other coins are referred to under the head of Hanover.

The schwer pfund weighs 320 pounds; the schiffpfund 280; the centner 112; the stein of wool 28; the lispfund and the stein of flax 14.

A last of corn is  $2\frac{1}{2}$  wispels, 10 scheffels, 100 himtens, or 400 spints.

The stubgen, liquid measure, is composed of 4 quartiers, or 16 nœssels.

The klafter, or fathom, is 3 ells, or 6 feet of Zell.

## ZURIC.

In this city of Switzerland, accounts are kept in livres, each livre consisting of 20 sols, and each sol of 12 deniers; or otherwise in guldens of 60 kreutzers, the kreutzer of 8 hellers.

The current thaler, or rixdollar, is  $1\frac{1}{2}$  reichs gulden,  $1\frac{1}{2}$  gulden of Zuric, 3 livres,  $28\frac{1}{2}$  batzes, 72 escalins, 108 kreutzers, 432 angsters, or 864 hellers.

3 guldens make 5 livres.

These monies are divided into exchange money and current money.

9 pieces exchange money make 10 pieces current money.



The coins are, the ducat of 4 guldens 18 kreutzers; the thaler; the batze; pieces of 1,  $\frac{1}{2}$ , and  $\frac{1}{4}$  escalin; and pieces of 2 hellers.

A louis d'or of France, coined since 1785, is worth 16 Swiss livres, and a French crown 4.

The marc, for weighing gold and silver, weighs 8 ounces, 16 loths, 64 quintilins, 256 fenins, or 4352 as: 2 marcs compose the pound small weight, which is used for weighing silks.

The pound great weight is 18 ounces, or 36 loths.

8 pounds great weight make 9 pounds small weight.

The mutte, corn measure, contains 4 viertels, 16 vierlings, 32 immis, or 64 mœslis.

The malter, fruit measure, is 16 viertels, 64 vierlings, or 256 mœslis.

A maas of salt contains 4 viertels.

The saum, liquid measure, is  $1\frac{1}{2}$  eimer, 6 viertels, 48 kopf, 96 maas, 192 quartli, or 384 stotsen.

The ell, cloth measure, is 2 feet of Zurich.

The ruthe, land measure, is 10 feet, and the foot 10 inches.

The juchart is 360 square ruthes.



MONIES, WEIGHTS, AND MEASURES.  
The coins are, the dollar of 4 golden 18 kreutzers; the thaler  
the piece of 1, 2, and 3 kreutzers; and pieces of 2 halves.  
A Louis d'or of France 1785, is worth 18 Swiss  
livres, and a French crown 4  
The mark, for weighing gold and silver, weight 8 ounces, 16  
The pound great weight is 16 ounces, or 32 pounds  
8 pounds great weight makes 9 pounds small weight.  
The number of 10 shillings

**TABLES**  
**OF**  
**Monies, Weights, and Measures.**

**TABLES OF PROPORTION**  
**OF THE**  
*Monies, Weights, and Measures of Foreign Nations, respectively  
with those of England.*

**I**N order to the attainment of a just comparison of foreign monies with those of England, the following Tables are sub-joined.

The *First* Table contains the denominations of the principal foreign monies of account, and their intrinsic value in English money, calculated upon the existing proportion between gold and silver in the respective countries.

The *Second* Table shews the names of the principal foreign coins in gold, their weight, their fineness, their pure contents, and the intrinsic value of each in relation to the gold coins of Great Britain.

The *Third* Table relates to silver coins, upon similar principles to those of the second.

The comparison of the weights and measures of foreign nations with those of England is established by the following Tables.

The *Fourth* Table bespeaks the names of the weights used for precious metals, the quantity which each contains in grains troy weight, and the relation of the several foreign weights to 100 pounds troy weight.

The *Fifth* Table denotes the names of the weights used in the sale of merchandize, the quantity which each contains in grains troy weight, and the relation of foreign weights to 100 and to 112 pounds avoirdupois weight.

The *Sixth* Table relates to the measures used in the sale of corn,



to the number of English cubic inches of the internal measurement of each, and to the relation of foreign measures to 10 quarters Winchester measure.

The *Seventh* Table comprises the measures for liquids, the quantity of English cubic inches which each contains internally, and the relation of foreign measures to 100 gallons English.

The *Eighth* Table relates to cloth measures, to the length of each in lines, and to the relation of foreign measures to 100 yards and to 100 ells.

The *Ninth* Table is descriptive of measures of length for measuring masts, timber, and other solid bodies, of the number of lines contained in each, and of the proportion between foreign measures of a similar description and 100 feet English.

The *Tenth* Table refers to land measures, to the quantity of English square feet which each contains, and to the proportion between foreign measures of this description and 100 acres.

The *Eleventh* and last Table is founded upon itinerary measures, the length of each in feet, and the proportion between the measures severally adopted in different countries and a degree of the equator.

Independently of the facility which will be afforded by these Tables in the comparison of the monies, weights, and measures of foreign nations with those of England, it will not be difficult to find the relation of the monies, weights, and measures of foreign countries in respect to each other, by the guidance of the explanations at the foot of each of the Tables in question.

It will be observed, that, in order to avoid the multiplicity of the denominators of fractions, and to give to the several calculations a greater degree of exactitude, the unit has constantly been divided, in the following Tables, into 100 parts. The Table which concludes this Work will shew the relation of decimal fractions to vulgar fractions.

|     |                          |
|-----|--------------------------|
| 100 | the pound sterling       |
| 20  | the shilling             |
| 12  | the pence                |
| 4   | the farthing             |
| 100 | the pound troy           |
| 12  | the ounce troy           |
| 8   | the penny troy           |
| 3   | the grain                |
| 100 | the pound avoirdupois    |
| 16  | the ounce avoirdupois    |
| 7   | the penny avoirdupois    |
| 4   | the farthing avoirdupois |
| 100 | the gallon               |
| 4   | the quart                |
| 2   | the pint                 |
| 1   | the gill                 |
| 100 | the bushel               |
| 4   | the peck                 |
| 2   | the quart                |
| 1   | the gill                 |
| 100 | the hundred weight       |
| 16  | the stone                |
| 8   | the hundred weight       |
| 4   | the hundred weight       |
| 2   | the hundred weight       |
| 1   | the hundred weight       |



## TABLE I.

*The intrinsic Value of the Monies of Account of Foreign Nations  
expressed in Pence Sterling.*

## MONIES OF ACCOUNT.

|                       |                                | Pence | 100 |
|-----------------------|--------------------------------|-------|-----|
| Aix la Chapelle ..... | the specie rixdollar.....      | 42,   | 75  |
|                       | the current rixdollar.....     | 32,   | 25  |
| Amsterdam .....       | the pound Flemish banco....    | 132,  | 48  |
|                       | the florin banco.....          | 22,   | 08  |
|                       | the pound Flemish current..    | 126,  | 36  |
|                       | the florin current .....       | 21,   | 06  |
| Arragon .....         | the libra jaquesa.....         | 47,   | 80  |
| Augsburg .....        | the gulden exchange money.     | 32,   | 51  |
|                       | the gulden currency.....       | 25,   | 60  |
|                       | the gulden white money....     | 21,   | 33  |
| Barcelona .....       | the libra catalana.....        | 27,   | 32  |
| Basil .....           | the rixdollar of exchange...   | 48,   | 25  |
|                       | the current rixdollar.....     | 43,   | 40  |
|                       | the current livre .....        | 14,   | 46  |
| Bengal .....          | the current rupee .....        | 21,   |     |
| Bergamo .....         | the lira.....                  | 5,    | 13  |
| Berlin .....          | the rixdollar gold currency.   | 39,   | 66  |
|                       | the rixdollar silver currency. | 35,   | 97  |
|                       | the pound banco.....           | 48,   | 75  |
| Bern .....            | the current livre .....        | 14,   | 67  |
| Bologna .....         | the scudo di cambio.....       | 48,   | 09  |
|                       | the lira di cambio.....        | 11,   | 31  |
|                       | the current livre.....         | 11,   | 05  |
| Bolzano .....         | the gulden exchange money.     | 35,   |     |
|                       | the gulden current money..     | 25,   | 66  |
| Bombay.....           | the current rupee.....         | 23,   | 63  |
| Bremen .....          | the rixdollar .....            | 38,   | 40  |
| Breslau .....         | the rixdollar gold currency.   | 39,   | 66  |
|                       | the rixdollar silver currency. | 35,   | 97  |
|                       | the pound banco.....           | 48,   | 75  |
| Brunswick.....        | the current thaler.....        | 38,   | 40  |
| Bussorah.....         | the mamudi .....               | 5,    | 50  |
| Canary Islands .....  | the current real.....          | 3,    | 82  |
| Cassel .....          | the thaler.....                | 38,   | 40  |
| China .....           | the tale.....                  | 80,   |     |
| Cologne.....          | the specie rixdollar.....      | 31,   | 71  |
|                       | the current rixdollar .....    | 30,   | 92  |
| Copenhagen .....      | the specie reichsthaler.....   | 55,   | 85  |
|                       | the current reichsthaler....   | 45,   | 46  |
| Curaçao .....         | the dollar.....                | 43,   | 09  |
| Dantzic .....         | the florin .....               | 9,    | 14  |
| Dublin.....           | the pound Irish.....           | 221,  | 54  |



## MONIES OF ACCOUNT.

|                         |                                | Pence | 100 |
|-------------------------|--------------------------------|-------|-----|
| <b>Elsinore</b> .....   | the specie rixdollar.....      | 34,   | 75  |
|                         | the crown rixdollar.....       | 32,   | 18  |
|                         | the current rixdollar .....    | 30,   | 92  |
| <b>England</b> .....    | the pound sterling .....       | 240,  |     |
| <b>Flanders</b> .....   | the florin of exchange.....    | 20,   | 25  |
|                         | the current florin.....        | 17,   | 37  |
| <b>Florence</b> .....   | the scudo d'oro.....           | 62,   | 45  |
|                         | the ducato .....               | 58,   | 29  |
|                         | the pezza of 8 reals.....      | 47,   | 88  |
|                         | the lira moneta buona.....     | 8,    | 32  |
| <b>France</b> .....     | the livre tournois .....       | 9,    | 49  |
|                         | the franc .....                | 9,    | 61  |
| <b>Frankfort</b> .....  | the thaler .....               | 38,   | 40  |
|                         | the gulden .....               | 25,   | 60  |
| <b>Genva</b> .....      | the current crown.....         | 49,   | 20  |
|                         | the current livre.....         | 16,   | 40  |
|                         | the florin .....               | 4,    | 68  |
| <b>Genoa</b> .....      | the scudo d'oro marche.....    | 89,   | 50  |
|                         | the scudo d'argento .....      | 73,   | 13  |
|                         | the pezza fuori di banco....   | 48,   | 12  |
|                         | the scudo di cambio.....       | 38,   | 50  |
|                         | the lira fuori di banco.....   | 8,    | 37  |
| <b>Germany</b> .....    | the reichsthaler constitution  |       |     |
|                         | money.....                     | 56,   | 84  |
|                         | the thaler ditto.....          | 42,   | 63  |
|                         | the gulden ditto .....         | 28,   | 42  |
|                         | the reichsthaler convention    |       |     |
|                         | money.....                     | 51,   | 20  |
|                         | the thaler ditto.....          | 38,   | 40  |
|                         | the gulden ditto .....         | 25,   | 60  |
| <b>Hamburg</b> .....    | the pound Flemish banco...138, | 37    |     |
|                         | the rixdollar banco.....       | 55,   | 35  |
|                         | the marc banco.....            | 18,   | 45  |
|                         | the rixdollar currency .....   | 45,   |     |
|                         | the marc currency.....         | 15,   |     |
| <b>Hanover</b> .....    | the current thaler.....        | 42,   | 63  |
| <b>Konigsberg</b> ..... | the gulden .....               | 12,   | 17  |
| <b>Leghorn</b> .....    | the pezza of 8 reals.....      | 47,   | 88  |
|                         | the lira moneta buona.....     | 8,    | 32  |
|                         | the lira moneta lunga.....     | 7,    | 97  |
| <b>Leipsic</b> .....    | the current thaler.....        | 38,   | 40  |
| <b>Liege</b> .....      | the gulden .....               | 12,   | 96  |
| <b>Lubec</b> .....      | the reichsthaler .....         | 45,   | 21  |
|                         | the marc .....                 | 15,   | 07  |
| <b>Lucca</b> .....      | the scudo d'oro.....           | 56,   | 32  |
|                         | the lira.....                  | 7,    | 51  |
| <b>Madras</b> .....     | the pagoda of 36 fanams....    | 94,   | 75  |
|                         | the rupee of 10 fanams....     | 26,   | 32  |



## MONIES OF ACCOUNT.

|                   |                                          | Pence | 100 |
|-------------------|------------------------------------------|-------|-----|
| Malta.....        | the silver crown.....                    | 40,   | 26  |
|                   | the copper crown.....                    | 26,   | 84  |
| Martinique.....   | the livre currency.....                  | 7,    | 12  |
| Mexico.....       | the dollar.....                          | 52,   | 60  |
| Milan.....        | the scudo imperiale.....                 | 64,   | 14  |
|                   | the current scudo.....                   | 45,   | 33  |
|                   | the lira currency.....                   | 7,    | 88  |
| Modena.....       | the lira.....                            | 3,    | 81  |
| Morocco.....      | the ducat.....                           | 105,  |     |
| Munich.....       | the current thaler.....                  | 32,   | 04  |
|                   | the current gulden.....                  | 21,   | 36  |
| Naples.....       | the ducato di regno.....                 | 42,   | 50  |
| Navarre.....      | the ducado of 10 <sup>8</sup> reals..... | 53,   | 95  |
|                   | the libra of 60 maravedis...             | 8,    | 25  |
|                   | the real of 36 ditto.....                | 4,    | 95  |
| Nuremberg.....    | the current thaler.....                  | 38,   | 40  |
|                   | the thaler gold money.....               | 38,   | 95  |
|                   | the thaler white money.....              | 31,   | 97  |
| Pegu.....         | the silver tical.....                    | 33,   | 70  |
| Persia.....       | the toman.....                           | 289,  | 65  |
| Poland.....       | the florin of Great Poland..             | 7,    | 10  |
|                   | the florin of Little Poland..            | 14,   | 20  |
| Pondicherry.....  | the pagoda.....                          | 93,   | 50  |
|                   | the rupee.....                           | 24,   | 20  |
| Portugal.....     | the milreis.....                         | 67,   | 50  |
| Prague.....       | the current gulden.....                  | 25,   | 60  |
| Ratisbon.....     | the gulden white money....               | 25,   | 60  |
| Riga.....         | the albertus rixdollar.....              | 53,   | 29  |
| Rome.....         | the scudo di stampa d'oro..              | 80,   | 92  |
|                   | the scudo moneta.....                    | 53,   | 16  |
| Rostock.....      | the thaler.....                          | 45,   | 20  |
|                   | the zweydrittel.....                     | 30,   | 13  |
| Russia.....       | the ruble.....                           | 33,   | 58  |
| St. Eustatia..... | the dollar.....                          | 38,   | 25  |
| St. Gall.....     | the gulden exchange money.               | 27,   | 90  |
|                   | the gulden currency.....                 | 24,   |     |
| Sardinia.....     | the lira.....                            | 11,   | 50  |
| Siam.....         | the gold tical.....                      | 465,  | 50  |
|                   | the silver tical.....                    | 39,   | 25  |
| Sicily.....       | the onza.....                            | 130,  | 77  |
| Smyrna.....       | the piastre.....                         | 13,   | 50  |
| Spain.....        | the pistole of exchange.....             | 153,  |     |
|                   | the ducat of exchange.....               | 52,   | 73  |
|                   | the dollar of exchange.....              | 38,   | 25  |
|                   | the real of plate.....                   | 4,    | 78  |
|                   | the real of vellon.....                  | 2,    | 54  |
| Sweden.....       | the riksdahler.....                      | 55,   | 35  |
| Surat.....        | the rupee.....                           | 25,   |     |



## MONIES OF ACCOUNT.

|                           |                                          | Pence | 100 |
|---------------------------|------------------------------------------|-------|-----|
| Surinam.....              | the florin .....                         | 25,   | 25  |
| Trieste .....             | the gulden of 60 kreitzers..             | 25,   | 60  |
|                           | the florin of 5 lire.....                | 24,   | 20  |
| Turin.....                | the scudo of 6 lire.....                 | 69,   | 84  |
|                           | the lira.....                            | 11,   | 64  |
| Turkey .....              | the piastre.....                         | 13,   | 50  |
| United States of America. | the dollar <i>at par</i> .....           | 54,   |     |
| Valencia .....            | the libra of 20 sueldos .....            | 38,   | 25  |
| Venice .....              | the lira piccoli <i>inclusive of the</i> |       |     |
|                           | <i>agio on the zecchins</i> .....        | 5,    | 12  |
| Vienna .....              | the current thaler.....                  | 38,   | 40  |
|                           | the current gulden .....                 | 25,   | 60  |
| Zante.....                | the real of 10 lire.....                 | 41,   | 15  |
| Zurich .....              | the gulden exchange money.               | 27,   | 50  |
|                           | the gulden currency.....                 | 25,   |     |

The following Example will shew in what manner the relation between the monies of account of any two given countries may be ascertained:—

*Example.*

Let it be required to express, in pence Irish, the value of a marc banco of Hamburg.

The marc being worth 18,45 pence sterling, and the pound Irish 221,54, according to the table prefixed, I state the following equation:

$$\begin{array}{rcl}
 1 \text{ marc banco} & = & 18,45 \text{ pence sterling} \\
 221,54 \text{ pence sterling} & = & 1 \text{ pound Irish} \\
 1 \text{ pound Irish} & = & 240 \text{ pence Irish.} \\
 \hline
 & \text{Result } 19,99 \text{ pence Irish.} &
 \end{array}$$



## TABLE II.

*The Weight, Fineness, and pure Contents, of the principal Gold Coins of Foreign Nations, as well as their intrinsic Value, expressed in English Money.*

## GOLD COINS.

|                     | Weight.                         |        | Fineness. |                | Pure contents. |      | Value. |         |
|---------------------|---------------------------------|--------|-----------|----------------|----------------|------|--------|---------|
|                     | Grs.                            | 100.   | Car.      | grs.           | Grs.           | 100. | s.     | d. 100. |
| Bavaria . . . . .   | the carl . . . . .              | 150,32 | 18        | $2\frac{5}{6}$ | 117,18         | 20   | 8,87   |         |
|                     | the max . . . . .               | 100,21 | 18        | $2\frac{2}{3}$ | 77,94          | 13   | 9,54   |         |
| Bengal . . . . .    | the gold mohur . . . . .        | 176,50 | 23        | 3              | 174,66         | 30   | 10,95  |         |
| Brunswick . . . . . | the carl . . . . .              | 102,36 | 21        | 3              | 92,76          | 16   | 5,02   |         |
| Denmark . . . . .   | the ducat of 12 marcs . . . . . | 48,21  | 21        | $0\frac{2}{3}$ | 42,52          | 7    | 6,30   |         |
| England . . . . .   | the guinea . . . . .            | 129,44 | 22        |                | 118,65         | 21   |        |         |
|                     | the half guinea . . . . .       | 64,72  | 22        |                | 59,33          | 10   | 6,     |         |
|                     | the 7 shilling piece . . . . .  | 43,13  | 22        |                | 39,55          | 7    |        |         |
|                     | the sovereign of 1817 . . . . . | 124,   | 22        |                | 113,50         | 20   |        |         |
|                     | the half ditto . . . . .        | 62,    | 22        |                | 56,75          | 10   |        |         |
| Flanders . . . . .  | the double souverain . . . . .  | 171,50 | 22        |                | 157,20         | 27   | 9,79   |         |
|                     | the souverain . . . . .         | 85,75  | 22        |                | 78,60          | 13   | 10,89  |         |
| France . . . . .    | the louis of 1726 . . . . .     | 122,90 | 21        | $2\frac{2}{3}$ | 110,95         | 19   | 7,65   |         |
|                     | the louis of 1785 . . . . .     | 117,83 | 21        | $2\frac{2}{3}$ | 106,37         | 18   | 9,93   |         |
|                     | the 40 franc piece . . . . .    | 199,25 | 21        | $2\frac{2}{5}$ | 179,32         | 31   | 8,85   |         |
|                     | the 20 franc piece . . . . .    | 99,62  | 21        | $2\frac{2}{5}$ | 89,66          | 15   | 10,42  |         |
| Geneva . . . . .    | the pistole of 1752 . . . . .   | 87,13  | 22        |                | 79,87          | 14   | 1,63   |         |
| Genoa . . . . .     | the zecchino . . . . .          | 53,80  | 23        | $3\frac{1}{2}$ | 53,52          | 9    | 5,67   |         |
| Germany . . . . .   | the ducat . . . . .             | 53,85  | 23        | $2\frac{2}{3}$ | 53,10          | 9    | 4,78   |         |
| Hamburg . . . . .   | the ducat . . . . .             | 53,85  | 23        | 2              | 52,73          | 9    | 4,     |         |
| Hanover . . . . .   | the georges . . . . .           | 103,03 | 21        | 3              | 93,37          | 16   | 6,31   |         |
|                     | the gold gulden . . . . .       | 50,06  | 19        | $0\frac{1}{3}$ | 39,80          | 7    | 0,54   |         |
| Holland . . . . .   | the ryder . . . . .             | 153,54 | 22        |                | 140,74         | 24   | 10,92  |         |
|                     | the ducat . . . . .             | 53,85  | 23        | 2              | 52,73          | 9    | 4,     |         |
| Hungary . . . . .   | the ducat of Kremnitz . . . . . | 53,85  | 23        | 3              | 53,29          | 9    | 5,18   |         |
| Madras . . . . .    | the star pagoda . . . . .       | 52,75  | 19        | 2              | 42,86          | 7    | 7,03   |         |
| Naples . . . . .    | the onza . . . . .              | 68,10  | 21        |                | 59,59          | 10   | 6,56   |         |
| Piedmont . . . . .  | the zecchino . . . . .          | 54,    | 23        | $3\frac{1}{2}$ | 53,72          | 9    | 6,09   |         |
|                     | the pistole of 1741 . . . . .   | 110,10 | 21        | 3              | 99,78          | 17   | 7,92   |         |
|                     | the doppia of 1755 . . . . .    | 148,50 | 21        | 3              | 134,58         | 23   | 9,83   |         |
| Portugal . . . . .  | the joanese . . . . .           | 221,87 | 22        |                | 203,39         | 36   |        |         |
|                     | the moidore . . . . .           | 166,   | 21        | $3\frac{3}{4}$ | 151,30         | 26   | 9,35   |         |
| Prussia . . . . .   | the frederick . . . . .         | 103,03 | 21        | 3              | 93,37          | 16   | 6,31   |         |
| Rome . . . . .      | the zecchino . . . . .          | 53,55  | 23        | 2              | 52,43          | 9    | 3,36   |         |
| Russia . . . . .    | the imperial of 1755 . . . . .  | 255,53 | 22        |                | 234,23         | 41   | 5,49   |         |
|                     | the imperial of 1763 . . . . .  | 202,18 | 22        |                | 185,33         | 32   | 9,62   |         |
|                     | the imperial of 1801 . . . . .  | 202,18 | 23        | $2\frac{1}{2}$ | 199,90         | 35   | 2,70   |         |



## GOLD COINS.

|                                                    | Weight.   | Fineness.         | Pure contents. | Value. |         |
|----------------------------------------------------|-----------|-------------------|----------------|--------|---------|
|                                                    | Grs. 100. | Car. grs.         | Grs. 100.      | s.     | d. 100. |
| Saxony . . . . the august . . . . .                | 102,      | 21 $2\frac{2}{3}$ | 92,08          | 16     | 3,57    |
| Siam . . . . . the tical . . . . .                 | 281,88    | 19 $0\frac{1}{3}$ | 224,13         | 39     | 8,04    |
| Sicily . . . . . the onza . . . . .                | 67,94     | 21 3              | 61,57          | 10     | 10,77   |
| Spain . . . . . the doubloon before 1772 . . . . . | 416,65    | 21 $3\frac{3}{4}$ | 380,85         | 67     | 4,87    |
| the doubloon of 1772 . . . . .                     | 416,65    | 21 $2\frac{2}{3}$ | 376,14         | 66     | 6,88    |
| the doubloon of 1785 . . . . .                     | 416,65    | 21 2              | 373,25         | 66     | 0,74    |
| Sweden . . . . the adolphus . . . . .              | 102,95    | 15 $1\frac{1}{3}$ | 65,77          | 11     | 7,70    |
| Tuscany . . . the ruopono . . . . .                | 161,33    | 23 $3\frac{2}{3}$ | 160,77         | 28     | 5,45    |
| United States . the eagle . . . . .                | 268,66    | 22                | 246,27         | 43     | 7,05    |
| Venice . . . . the zecchino . . . . .              | 54,       | 23 $3\frac{1}{2}$ | 53,72          | 9      | 6,09    |
| Wirttemberg . the carl . . . . .                   | 150,32    | 18 $2\frac{5}{6}$ | 117,18         | 20     | 8,87    |

In the first column of this Table is shewn the weight of each foreign coin in grains troy weight; in the second column, the degree of fineness in carats and grains of a carat; in the third column, the contents of fine gold in grains troy weight; and in the fourth, the intrinsic value expressed in shillings and pence sterling.

The following Example will be of guidance to ascertain the value of a foreign coin in other money also foreign.

*Example.*

It is required to express the value of a louis d'or of France coined since 1785, in the money of Portugal.

As it is seen by the prefixed Table that the louis of 24 livres tournois contains 106,37 grains of fine gold, and that the joanese of 6400 reis contains 203,39 grains of fine gold, I state the following equation:

$$\begin{array}{rcl}
 & 1 & \text{louis} = x \\
 1 & \text{louis} & = 106,37 \text{ grains} \\
 203,39 \text{ grains} & = & 1 \text{ joanese} \\
 1 & \text{joanese} & = 6400 \text{ reis} \\
 & & \text{Result 3347 reis.}
 \end{array}$$



## TABLE III.

*The Weight, Fineness, and pure Contents, of the principal Silver Coins of Foreign Nations, as well as their intrinsic Value, expressed in English Money.*

## SILVER COINS.

|                                                                 | Weight.   |          | Fineness. |         | Pure contents. | Value.  |
|-----------------------------------------------------------------|-----------|----------|-----------|---------|----------------|---------|
|                                                                 | Grs. 100. | Oz. dwt. | Grs. 100. | d. 100. | Grs. 100.      | d. 100. |
| Aix la Chapelle. the rathspräsentger                            | 95.68     | 7 1      |           |         | 56.21          | 7.85    |
| Arabia . . . . . the larin . . . . .                            | 74.17     | 10 17½   |           |         | 56.84          | 7.93    |
| Basil . . . . . the reichsthaler . . . . .                      | 436.89    | 10 10    |           |         | 382.28         | 53.38   |
| Bengal . . . . . the sicca rupee . . . . .                      | 179.55    | 11 18½   |           |         | 178.43         | 24.92   |
| Bern . . . . . the patagon . . . . .                            | 417.63    | 10       |           |         | 348.           | 48.59   |
| Bombay . . . . . the rupee . . . . .                            | 178.31    | 11 15    |           |         | 174.60         | 24.38   |
| Denmark . . . . . the riksdahler . . . . .                      | 449.87    | 10 10    |           |         | 393.64         | 54.97   |
| the krohn . . . . .                                             | 344.      | 8 1      |           |         | 230.77         | 32.23   |
| England . . . . . the crown . . . . .                           | 464.52    | 11 2     |           |         | 429.68         | 60.00   |
| the shilling . . . . .                                          | 92.90     | 11 2     |           |         | 85.94          | 12.     |
| Flanders . . . . . the ducaton . . . . .                        | 513.29    | 10 8¾    |           |         | 446.46         | 62.34   |
| the croon . . . . .                                             | 456.91    | 10 8¾    |           |         | 395.71         | 55.26   |
| the patagon . . . . .                                           | 433.      | 10 10    |           |         | 378.88         | 52.91   |
| France . . . . . the ecu of 1726 . . . . .                      | 452.50    | 10 18    |           |         | 411.03         | 57.40   |
| the 5 franc piece . . . . .                                     | 386.14    | 10 16    |           |         | 347.52         | 48.53   |
| Geneva . . . . . the patagon . . . . .                          | 416.87    | 10       |           |         | 347.38         | 48.51   |
| Genoa . . . . . the genovina . . . . .                          | 593.10    | 11 9     |           |         | 565.93         | 79.03   |
| the St. Gianbatista . . . . .                                   | 321.66    | 11       |           |         | 294.85         | 41.17   |
| the giorgino . . . . .                                          | 91.25     | 10 6¾    |           |         | 78.58          | 10.97   |
| the double madonina . . . . .                                   | 140.19    | 10 1¾    |           |         | 117.80         | 16.45   |
| Germany . . . . . the reichsthaler constitution money . . . . . | 450.97    | 10 13¼   |           |         | 400.87         | 55.98   |
| the gulden ditto . . . . .                                      | 225.48    | 10 13¼   |           |         | 200.43         | 27.99   |
| the reichsthaler convention money . . . . .                     | 432.93    | 10       |           |         | 360.78         | 50.38   |
| the gulden ditto . . . . .                                      | 216.46    | 10       |           |         | 180.39         | 25.19   |
| the old zweydrittel . . . . .                                   |           |          |           |         | 229.05         | 31.98   |
| the new zweydrittel . . . . .                                   |           |          |           |         | 200.42         | 27.98   |
| Hamburg . . . . . the rixdollar banco . . . . .                 | 450.52    | 10 13¼   |           |         | 400.47         | 55.92   |
| the marc banco . . . . .                                        | 150.17    | 10 13¼   |           |         | 133.49         | 18.64   |
| the rixdollar lubs . . . . .                                    | 424.41    | 9        |           |         | 318.30         | 44.43   |
| the marc lubs . . . . .                                         | 141.47    | 9        |           |         | 106.10         | 14.81   |
| Holland . . . . . the ducatoon . . . . .                        | 503.50    | 11 5     |           |         | 472.03         | 65.91   |
| the three florin piece . . . . .                                | 488.      | 11       |           |         | 447.33         | 62.46   |
| the rixdaler . . . . .                                          | 433.17    | 10 10    |           |         | 379.03         | 52.93   |
| the leeuwendaler . . . . .                                      | 422.      | 8 18     |           |         | 312.98         | 43.70   |
| the gold florin . . . . .                                       | 307.      | 7 7      |           |         | 188.04         | 26.26   |
| the current florin . . . . .                                    | 162.70    | 10 19    |           |         | 148.46         | 20.73   |



## SILVER COINS.

|                                            | Weight. |      | Fineness. |                  | Pure contents. |      | Value. |      |
|--------------------------------------------|---------|------|-----------|------------------|----------------|------|--------|------|
|                                            | Grs.    | 100. | Oz.       | dwt              | Grs.           | 100. | d.     | 100. |
| Madras . . . . the rupee . . . . .         | 178,88  |      | 11        | 16 $\frac{1}{2}$ | 176,28         |      | 24,61  |      |
| Milan . . . . the philip . . . . .         | 430,21  |      | 11        | 8 $\frac{1}{2}$  | 409,30         |      | 57,15  |      |
| Naples . . . . the ducat . . . . .         | 336,    |      | 10        | 19               | 306,60         |      | 42,81  |      |
| Piedmont . . the ducatoon . . . . .        | 491,03  |      | 11        | 8 $\frac{1}{3}$  | 467,17         |      | 65,23  |      |
| the scudo of 1733 . . . .                  | 459,88  |      | 10        | 19 $\frac{1}{6}$ | 419,96         |      | 58,64  |      |
| the scudo of 1755 . . . .                  | 542,95  |      | 10        | 17 $\frac{1}{2}$ | 492,05         |      | 68,71  |      |
| Pondicherry . the rupee . . . . .          | 177,27  |      | 11        | 11               | 170,63         |      | 23,83  |      |
| Poland . . . . the tympe . . . . .         | 89,75   |      | 6         | 3 $\frac{1}{2}$  | 46,12          |      | 6,44   |      |
| Portugal . . . the cruzade . . . . .       | 265,65  |      | 10        | 15 $\frac{1}{2}$ | 238,54         |      | 33,31  |      |
| Prussia . . . . the current rixdollar . .  | 343,42  |      | 9         |                  | 257,57         |      | 35,97  |      |
| Rome . . . . . the scudo moneta . . . .    | 408,70  |      | 11        |                  | 374,64         |      | 52,31  |      |
| the testono . . . . .                      | 130,54  |      | 11        |                  | 119,67         |      | 16,71  |      |
| the papeta . . . . .                       | 81,59   |      | 11        |                  | 74,79          |      | 10,44  |      |
| Russia . . . . the ruble of 1755 . . . . . | 402,76  |      | 9         | 10               | 318,85         |      | 44,52  |      |
| the ruble of 1763 . . . .                  | 369,88  |      | 9         |                  | 277,41         |      | 38,74  |      |
| the ruble of 1801 . . . .                  | 277,48  |      | 10        | 8                | 240,48         |      | 33,58  |      |
| the livonina of 1757 . .                   | 411,66  |      | 9         | 1 $\frac{1}{4}$  | 310,99         |      | 43,41  |      |
| the rixdollar albertus . .                 | 433,17  |      | 10        | 10               | 379,03         |      | 52,93  |      |
| Saxony . . . . the old reichsthaler . .    | 450,97  |      | 10        | 13 $\frac{1}{3}$ | 400,87         |      | 55,98  |      |
| the new reichsthaler . .                   | 432,93  |      | 10        |                  | 360,78         |      | 50,38  |      |
| the zweydrittelstucke .                    | 212,14  |      | 11        | 6 $\frac{2}{3}$  | 200,35         |      | 27,98  |      |
| Spain . . . . . the hard dollar before     |         |      |           |                  |                |      |        |      |
| 1772 . . . . .                             | 416,40  |      | 10        | 18 $\frac{1}{3}$ | 378,81         |      | 52,90  |      |
| the hard dollar since                      |         |      |           |                  |                |      |        |      |
| 1772 . . . . .                             | 416,40  |      | 10        | 15               | 373,03         |      | 52,09  |      |
| Sweden . . . . the reichsthaler of 1764 .  | 451,56  |      | 10        | 10 $\frac{5}{6}$ | 396,69         |      | 55,39  |      |
| the ducatoon . . . . .                     | 484,    |      | 11        | 1 $\frac{1}{4}$  | 446,18         |      | 62,30  |      |
| the carolin . . . . .                      | 160,51  |      | 8         | 6 $\frac{2}{3}$  | 111,47         |      | 15,56  |      |
| the ten oere silver piece .                | 108,30  |      | 5         | 6 $\frac{2}{3}$  | 48,13          |      | 6,72   |      |
| Tuscany . . . . the francescono . . . . .  | 422,75  |      | 11        |                  | 387,52         |      | 54,11  |      |
| the lanternina . . . . .                   | 420,    |      | 11        | 1                | 386,75         |      | 54,    |      |
| the livornina . . . . .                    | 402,    |      | 11        | 1                | 370,18         |      | 51,69  |      |
| United States, the dollar . . . . .        | 409,79  |      | 11        |                  | 375,64         |      | 52,45  |      |
| Venice . . . . the ducat . . . . .         | 350,83  |      | 9         | 18               | 289,44         |      | 40,42  |      |
| the scudo . . . . .                        | 489,54  |      | 11        |                  | 448,75         |      | 62,66  |      |
| the giustina . . . . .                     | 433,17  |      | 11        |                  | 397,07         |      | 55,45  |      |

In the first column of this Table is shewn the weight of each foreign coin in grains troy weight; in the second column, the degree of fineness in carats and grains of a carat; in the third column, the contents of fine silver in grains troy weight; and in the fourth, the intrinsic value expressed in pence sterling.



The following Example will shew in what manner the value of a foreign coin in other money also foreign may be ascertained.

*Example.*

It is required to express the value of a Spanish hard dollar in the money of France.

As it is seen by the prefixed Table that the hard dollar contains 373,03 grains of fine silver, and that the piece of 5 francs contains 347,52 grains of fine silver, I state the following equation :

|        |             |   |                           |
|--------|-------------|---|---------------------------|
| 1      | hard dollar | = | $x$                       |
| 1      | hard dollar | = | 373,03 grains             |
| 347,52 | grains      | = | 5 franc piece             |
|        |             |   | Result 5 francs 37 cents. |

In the first column of this Table is shown the weight of each foreign coin in grains Troy weight; in the second column, the value of pieces in francs and grains of a cent; in the third column, the contents of fine silver in grains Troy weight; and in the fourth, the intrinsic value expressed in pence.



## TABLE IV.

*The Quantity of Grains Troy Weight contained by each of the Weights used in the Trade of precious Metals, and the Relation of Foreign Weights to 100 Pounds Troy Weight.*

| TROY WEIGHT.         |                          | Contents<br>of each<br>weight. | Equiva-<br>lence to<br>100 pounds |
|----------------------|--------------------------|--------------------------------|-----------------------------------|
| Places.              | Weights.                 | Grains.                        | Numb. 100                         |
| Amsterdam .....      | marc .....               | 3798                           | 151,66                            |
| Antwerp .....        | marc .....               | 3798                           | 151,66                            |
| Augsburg .....       | marc .....               | 3643                           | 158,09                            |
| Basil .....          | marc .....               | 3612                           | 159,46                            |
| Berlin .....         | marc .....               | 3616                           | 159,30                            |
| Bern .....           | marc .....               | 3813                           | 151,06                            |
| Bombay .....         | tola .....               | 178 $\frac{1}{4}$              | 3231,25                           |
| Bonn .....           | marc .....               | 3609                           | 159,62                            |
| Botzen .....         | marc .....               | 4330                           | 133,04                            |
| Bremen .....         | marc .....               | 3612                           | 159,46                            |
| Breslau .....        | marc .....               | 3016                           | 199,99                            |
| Brunswick .....      | marc .....               | 3603                           | 159,85                            |
| Brussels .....       | marc .....               | 3798                           | 151,66                            |
| Cairo .....          | rotolo .....             | 6887                           | 83,64                             |
| China .....          | tale .....               | 579                            | 994,81                            |
| Cologne .....        | marc .....               | 3612                           | 159,46                            |
| Constantinople ..... | cheky .....              | 4926                           | 116,93                            |
| Copenhagen .....     | marc .....               | 3641                           | 158,19                            |
| Coromandel .....     | seer .....               | 4293                           | 134,16                            |
| Cracow .....         | marc .....               | 3069                           | 187,68                            |
| Damascus .....       | rotolo .....             | 34432                          | 16,73                             |
| Dantzic .....        | marc .....               | 3605 $\frac{1}{2}$             | 159,75                            |
| Dresden .....        | marc .....               | 3605 $\frac{1}{2}$             | 159,75                            |
| England .....        | pound .....              | 5760                           | 100,00                            |
| Florence .....       | ounce .....              | 480                            | 1200,00                           |
|                      | pound .....              | 5244                           | 109,84                            |
| France .....         | marc .....               | 3780                           | 152,33                            |
|                      | kilogramme .....         | 15446                          | 37,29                             |
| Frankfort .....      | marc .....               | 3612                           | 159,46                            |
| Geneva .....         | marc .....               | 3787 $\frac{3}{4}$             | 152,07                            |
| Genoa .....          | pound .....              | 4897 $\frac{2}{3}$             | 117,61                            |
| Hamburg .....        | marc .....               | 3608                           | 159,64                            |
| Hanover .....        | marc .....               | 3608                           | 159,64                            |
| Holland .....        | marc .....               | 3798                           | 151,66                            |
| Japan .....          | tale .....               | 580 $\frac{5}{8}$              | 992,02                            |
| Konigsberg .....     | marc .....               | 3023                           | 190,52                            |
|                      | idem Berlin weight ..... | 3616                           | 159,30                            |
| Leghorn .....        | pound .....              | 5244                           | 109,84                            |
| Leipsic .....        | marc .....               | 3606                           | 159,75                            |
| Liege .....          | marc .....               | 3800                           | 151,58                            |



## TROY WEIGHT.

| Places.          | Weights.      | Contents<br>of each<br>weight. | Equiva-<br>lence to<br>100 pounds |
|------------------|---------------|--------------------------------|-----------------------------------|
|                  |               | Grains.                        | Numb, 100                         |
| Lubec.....       | marc .....    | 3608                           | 159,64                            |
| Magdeburg .....  | marc .....    | 3607                           | 159,68                            |
| Malabar .....    | seer .....    | 4293                           | 134,16                            |
| Manheim .....    | marc .....    | 3611                           | 159,49                            |
| Milan .....      | marc .....    | 3631                           | 158,63                            |
| Munich .....     | marc .....    | 3612                           | 159,46                            |
| Naples .....     | pound .....   | 4954                           | 116,27                            |
| Nuremberg .....  | marc .....    | 3688                           | 156,19                            |
| Pegu.....        | tical .....   | 237 $\frac{1}{4}$              | 2427,80                           |
| Persia .....     | mitigal ..... | 71 $\frac{3}{4}$               | 8027,90                           |
| Pisa.....        | pound .....   | 5237                           | 110,00                            |
| Pondicherry..... | seer .....    | 4293                           | 134,16                            |
| Portugal.....    | marc .....    | 3542 $\frac{1}{2}$             | 162,60                            |
| Prague .....     | marc .....    | 3916                           | 147,08                            |
| Ratisbon .....   | marc .....    | 3800                           | 151,58                            |
| Riga .....       | marc .....    | 3227                           | 178,50                            |
| Rome .....       | pound .....   | 5239                           | 109,95                            |
| Russia .....     | pound .....   | 6314                           | 91,23                             |
| Sienna .....     | pound .....   | 5179                           | 111,22                            |
| Spain .....      | marc .....    | 3551                           | 162,21                            |
| Sweden.....      | marc .....    | 3252                           | 177,12                            |
| Surat .....      | tola .....    | 187 $\frac{1}{2}$              | 3066,35                           |
| Tripoli .....    | mitical ..... | 73 $\frac{1}{2}$               | 7810,16                           |
| Tunis .....      | ounce .....   | 486 $\frac{1}{2}$              | 1183,96                           |
| Turin .....      | marc .....    | 3799                           | 151,62                            |
| Venice .....     | marc .....    | 3686                           | 156,26                            |
|                  | ounce .....   | 460 $\frac{3}{4}$              | 1250,12                           |
| Vienna .....     | marc .....    | 4333                           | 132,93                            |
| Warsaw .....     | marc .....    | 3114                           | 184,97                            |
| Wilna .....      | marc .....    | 3006                           | 191,62                            |
| Wurtemberg.....  | marc .....    | 3612                           | 159,46                            |
| Zurich .....     | marc .....    | 3615                           | 159,34                            |

The following Examples will shew in what manner the proportion between the weights of any two given countries may be ascertained.

It is required to reduce 100 marcs of Hamburg into marcs of France.

The marc of Hamburg weighing 3608 grains, and the marc of France 3780, according to the table prefixed, I state the following equation:

$$\begin{array}{rcl}
 & & 100 \text{ marcs of Hamburg} = x \\
 1 \text{ marc of Hamburg} & = & 3608 \text{ grains} \\
 3780 \text{ grains} & = & 1 \text{ marc of France} \\
 & & \text{Result 95,45 marcs of France.}
 \end{array}$$

Reduce 100 marcs of France into marcs of Hamburg.

$$\begin{array}{rcl}
 & & 100 \text{ marcs of France} = x \\
 1 \text{ marc of France} & = & 3780 \text{ grains} \\
 3608 \text{ grains} & = & 1 \text{ marc of Hamburg} \\
 & & \text{Result 104,76 marcs of Hamburg.}
 \end{array}$$



## TABLE V.

*The Quantity of Grains Troy Weight contained by each of the Weights used in the Sale of Merchandize, and the Relation of Foreign Weights to 100 Pounds and 112 Pounds Avoirdupois Weight.*

## AVOIRDUPOIS WEIGHT.

| Places.               | Weights.                      | Contents of each weight. — Grains. | Equiv. to 100 pounds. — Num. 100. | Equiv. to 112 pounds. — Num. 100. |
|-----------------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|
| Achem .....           | catti .....                   | 14675                              | 47,70                             | 53,42                             |
| Aix in France .....   | pound .....                   | 6310                               | 110,94                            | 124,25                            |
| Aix la Chapelle ..... | pound .....                   | 7235                               | 96,75                             | 108,26                            |
| Algiers .....         | rotolo .....                  | 8345                               | 83,89                             | 93,95                             |
| Aleppo .....          | idem of 720 drams .....       | 35190                              | 19,89                             | 22,28                             |
|                       | idem of 700 .....             | 34213                              | 20,46                             | 22,92                             |
|                       | idem of 680 .....             | 33235                              | 21,06                             | 23,59                             |
|                       | idem of 600 .....             | 29315                              | 23,87                             | 26,73                             |
|                       | idem of 400 .....             | 19550                              | 35,81                             | 40,10                             |
| Alexandria .....      | rotolo zauro .....            | 14579                              | 48,01                             | 54,77                             |
|                       | idem zaidino .....            | 9346                               | 74,90                             | 83,89                             |
|                       | idem forforo .....            | 6579                               | 106,40                            | 119,16                            |
| Alexandretta .....    | mine .....                    | 11663                              | 60,02                             | 67,22                             |
| Alicante .....        | libra mayor .....             | 8004                               | 87,45                             | 97,95                             |
|                       | libra menor .....             | 5336                               | 131,18                            | 146,93                            |
| Altona .....          | pound .....                   | 7477                               | 93,62                             | 104,86                            |
| Amberg .....          | pound .....                   | 9257                               | 75,62                             | 84,70                             |
| Amsterdam .....       | pound commercial weight ..... | 7625                               | 91,80                             | 102,82                            |
|                       | pound apothecary weight ..... | 5696                               | 122,88                            | 137,63                            |
| Ancona .....          | pound .....                   | 5183                               | 135,05                            | 151,26                            |
| Anspach .....         | pound .....                   | 7868                               | 88,97                             | 99,64                             |
| Antwerp .....         | pound .....                   | 7261                               | 96,40                             | 107,97                            |
| Archangel .....       | pound .....                   | 6314                               | 110,87                            | 124,18                            |
| Arragon .....         | libra pensil .....            | 5326                               | 131,43                            | 147,20                            |
| Augsburg .....        | pfund frohngewicht .....      | 7580                               | 92,34                             | 103,42                            |
|                       | pfund kramgewicht .....       | 7295                               | 95,95                             | 107,46                            |
| Avignon .....         | pound .....                   | 6084                               | 115,05                            | 128,85                            |
| Bamberg .....         | pound .....                   | 7494                               | 93,41                             | 104,62                            |
| Barcelona .....       | pound .....                   | 6214                               | 112,65                            | 126,16                            |
| Basil .....           | pound .....                   | 7561                               | 92,58                             | 103,69                            |
| Batavia .....         | catti .....                   | 9450                               | 74,08                             | 82,96                             |
| Bautzen .....         | pound .....                   | 6690                               | 104,63                            | 117,18                            |
| Bayonne .....         | livre .....                   | 7561                               | 92,58                             | 103,69                            |
| Bayreuth .....        | pound .....                   | 7989                               | 87,63                             | 98,14                             |
| Beetlefakee .....     | maund .....                   | 11773                              | 59,40                             | 66,59                             |



## AVOIRDUPOIS WEIGHT.

| Places.            | Weights.                 | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv. to<br>112<br>pounds. |
|--------------------|--------------------------|--------------------------------|-----------------------------|-----------------------------|
|                    |                          | Grains.                        | Num. 100.                   | Num. 100.                   |
| Bengal .....       | factory maund.....       |                                | 1,34                        | 1,50                        |
|                    | bazar maund.....         |                                | 1,22                        | 1,36                        |
| Bergamo .....      | pound peso forte.....    | 12581                          | 55,64                       | 62,31                       |
|                    | pound light weight....   | 5033                           | 139,09                      | 155,78                      |
| Bergen .....       | pound.....               | 7716                           | 90,72                       | 101,60                      |
| Bergen op Zoom..   | pound.....               | 7343                           | 95,33                       | 106,77                      |
| Berlin .....       | pound.....               | 7233                           | 96,78                       | 108,40                      |
| Bern.....          | pound.....               | 8068                           | 86,76                       | 97,18                       |
| Bilboa .....       | pound.....               | 7561                           | 92,58                       | 103,69                      |
| Bois-le-Duc.....   | pound.....               | 7196                           | 97,27                       | 108,95                      |
| Bologna .....      | pound.....               | 5590                           | 125,21                      | 140,24                      |
| Bolzano .....      | pound.....               | 7733                           | 90,52                       | 101,38                      |
| Bombay .....       | maund .....              |                                | 2,63                        | 2,95                        |
| Bordeaux.....      | pound city weight ....   | 7637                           | 91,66                       | 102,66                      |
|                    | pound poids de marc..    | 7561                           | 92,58                       | 103,69                      |
| Bremen .....       | pound.....               | 7700                           | 90,92                       | 101,83                      |
| Breslau .....      | pound.....               | 6256                           | 111,90                      | 125,33                      |
| Bruges .....       | pound.....               | 7261                           | 96,40                       | 107,97                      |
| Brunswick .....    | pound .....              | 7207                           | 97,13                       | 108,79                      |
| Brussels .....     | pound.....               | 7261                           | 96,40                       | 107,97                      |
| Bussorah .....     | maund seffi .....        |                                | 1,11                        | 1,24                        |
|                    | maund à tary.....        |                                | 3,51                        | 3,93                        |
| Cadiz .....        | pound.....               | 7102                           | 98,57                       | 110,40                      |
| Cairo .....        | rotolo .....             | 6665                           | 105,04                      | 117,64                      |
| Calais.....        | pound heavy weight....   | 7870                           | 88,95                       | 99,62                       |
|                    | pound light weight....   | 6501                           | 107,67                      | 120,59                      |
| Calicut.....       | maund .....              |                                | 3,33                        | 3,73                        |
| Canary Islands ... | pound.....               | 7094                           | 98,67                       | 110,52                      |
| Canea.....         | rotolo heavy weight ...  | 8127                           | 86,13                       | 96,47                       |
|                    | rotolo light weight .... | 5277                           | 132,64                      | 148,56                      |
| Canton .....       | catti .....              | 8640                           | 81,                         | 90,72                       |
| Carthagera .....   | pound.....               | 7102                           | 98,57                       | 110,40                      |
| Cassel .....       | pound.....               | 4887                           | 143,23                      | 160,42                      |
| Castille .....     | pound.....               | 7102                           | 98,57                       | 110,40                      |
| Cephalonia .....   | pound.....               | 7384                           | 94,80                       | 106,18                      |
| Chambery .....     | pound.....               | 6621                           | 105,72                      | 118,40                      |
| Civita Vecchia ... | pound.....               | 5267                           | 132,90                      | 148,85                      |
| Coburg .....       | pound.....               | 7868                           | 88,97                       | 99,64                       |
| Cologne .....      | pound.....               | 7225                           | 96,89                       | 108,52                      |
| Como .....         | pound.....               | 4789                           | 146,18                      | 163,72                      |
| Constance .....    | pound.....               | 7285                           | 96,08                       | 107,61                      |
| Constantinople ... | rotolo .....             | 8670                           | 80,74                       | 90,43                       |
| Copenhagen .....   | pound.....               | 7716                           | 90,72                       | 101,60                      |



## AVOIRDUPOIS WEIGHT.

| Places.                           | Weights.                                        | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|-----------------------------------|-------------------------------------------------|--------------------------------|-----------------------------|-----------------------------|
|                                   |                                                 | Grains.                        | Num. 100.                   | Num. 100                    |
| Corfu .....                       | pound .....                                     | 7384                           | 94,80                       | 106,18                      |
| Coromandel.....                   | vis. ....                                       | 23333                          | 30,                         | 33,59                       |
| Corsica .....                     | pound .....                                     | 5315                           | 131,70                      | 147,50                      |
| Corunna.....                      | pound .....                                     | 8877                           | 78,85                       | 88,31                       |
| Courtray .....                    | pound .....                                     | 6749                           | 103,58                      | 116,                        |
| Cracow .....                      | pound .....                                     | 6271                           | 111,63                      | 125,02                      |
| Cremona .....                     | pound .....                                     | 5060                           | 138,34                      | 154,94                      |
| Culmbach .....                    | pound .....                                     | 7989                           | 87,63                       | 98,14                       |
| Cyprus.....                       | rotolo.....                                     | 36710                          | 19,07                       | 21,36                       |
| Damascus .....                    | rotolo.....                                     | 27691                          | 25,28                       | 28,31                       |
| Dantzic .....                     | pound .....                                     | 6722                           | 104,15                      | 116,66                      |
| Denmark .....                     | pound .....                                     | 7716                           | 90,72                       | 101,60                      |
| Delft .....                       | pound .....                                     | 7625                           | 91,80                       | 102,82                      |
| Deventer .....                    | pound.....                                      | 7259                           | 96,42                       | 108,                        |
| Dieppe.....                       | pound.....                                      | 7630                           | 91,75                       | 102,76                      |
| Dixmude .....                     | pound.....                                      | 6639                           | 105,43                      | 118,09                      |
| Dordrecht .....                   | pound.....                                      | 7625                           | 91,80                       | 102,82                      |
| Dresden .....                     | pound .....                                     | 7211                           | 97,07                       | 108,72                      |
| Dublin.....                       | pound .....                                     | 7000                           | 100,                        | 112,                        |
| Dunkirk .....                     | pound .....                                     | 6615                           | 105,81                      | 118,52                      |
| Elbing .....                      | pound .....                                     | 6558                           | 106,74                      | 119,55                      |
| Elsinore.....                     | pound .....                                     | 7716                           | 90,72                       | 101,60                      |
| Embden .....                      | pound.....                                      | 7666                           | 91,31                       | 102,27                      |
| England .....                     | pound avoirdupois ....                          | 7000                           | 100,                        | 112,                        |
|                                   | pound apothecary<br>weight .....                | 5760                           | 121,53                      | 136,11                      |
| Erfurt .....                      | pound.....                                      | 7285                           | 96,08                       | 107,61                      |
| Ferrara .....                     | pound.....                                      | 5237                           | 133,67                      | 149,71                      |
| Ferrol .....                      | pound.....                                      | 8877                           | 78,85                       | 88,31                       |
| Fez.....                          | rotolo .....                                    | 7259                           | 96,42                       | 108,                        |
| Flensburg .....                   | pound .....                                     | 7461                           | 93,82                       | 105,08                      |
| Florence .....                    | pound .....                                     | 5401                           | 129,60                      | 145,15                      |
| Forli .....                       | pound .....                                     | 5084                           | 137,69                      | 154,22                      |
| France .....                      | pound poids de marc..                           | 7561                           | 92,58                       | 103,69                      |
|                                   | pound apothecary<br>weight .....                | 5568                           | 123,51                      | 138,33                      |
|                                   | kilogramme .....                                | 15446*                         | 45,32                       | 50,76                       |
|                                   | hectogramme.....                                | 1544 $\frac{3}{5}$             | 453,20                      | 507,60                      |
| Frankfort on the }<br>Maine ..... | pound heavy weight...<br>pound light weight.... | 7841<br>7210                   | 89,28<br>97,09              | 100,<br>108,74              |

\* The gramme, or the unit of French weights, is therefore equivalent to 15,446 grains troy weight.



## AVOIRDUPOIS WEIGHT.

| Places.           | Weights.                         | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|-------------------|----------------------------------|--------------------------------|-----------------------------|-----------------------------|
|                   |                                  | Grains.                        | Num. 100.                   | Num. 100                    |
| Frankfort on the  |                                  |                                |                             |                             |
| Oder .....        | pound .....                      | 7232                           | 96.80                       | 108.42                      |
| Freyberg .....    | pound .....                      | 7210                           | 97.09                       | 108.74                      |
| Flushing .....    | pound .....                      | 7189                           | 97.37                       | 109.06                      |
| Gaeta .....       | pound .....                      | 4553                           | 153.75                      | 172.20                      |
| Galicia .....     | pound .....                      | 8877                           | 78.85                       | 88.31                       |
| Gallipoli .....   | rotolo .....                     | 6978                           | 100.31                      | 112.35                      |
| Gand .....        | pound .....                      | 7261                           | 96.40                       | 107.97                      |
| Geneva .....      | pound heavy weight...            | 8502                           | 82.34                       | 92.22                       |
|                   | pound light weight....           | 7085                           | 98.70                       | 110.66                      |
| Genoa .....       | Custom House rotolo..            | 8258                           | 84.77                       | 94.94                       |
|                   | rotolo peso di cassa...          | 7506                           | 93.25                       | 104.45                      |
|                   | rotolo cantaro weight..          | 7360                           | 95.11                       | 106.52                      |
|                   | pound peso grosso ....           | 4907                           | 142.65                      | 159.77                      |
|                   | pound peso sottile ....          | 4898                           | 142.92                      | 160.07                      |
| Germany .....     | pound apothecary<br>weight ..... | 5527                           | 126.64                      | 141.84                      |
| Gibraltar .....   | pound .....                      | 7215                           | 97.01                       | 108.55                      |
|                   | pound Cadiz weight ...           | 7102                           | 98.57                       | 110.40                      |
| Gottenburg .....  | pound victualie weight.          | 6563                           | 106.66                      | 119.46                      |
|                   | pound for weighing iron          | 5250                           | 133.33                      | 149.33                      |
| Granada .....     | pound heavy weight...            | 7707                           | 90.82                       | 101.72                      |
|                   | pound light weight ....          | 6860                           | 102.05                      | 114.30                      |
| Groningen .....   | pound .....                      | 7552                           | 92.69                       | 103.81                      |
| Gueldres .....    | pound .....                      | 7205                           | 97.15                       | 108.81                      |
| Hamburg .....     | pound commercial<br>weight ..... | 7481                           | 93.57                       | 104.80                      |
|                   | pound Cologne weight.            | 7224                           | 96.89                       | 108.52                      |
| Hanover .....     | pound .....                      | 7494                           | 93.40                       | 104.61                      |
| Harburg .....     | pound .....                      | 7494                           | 93.40                       | 104.61                      |
| Haarlem .....     | pound .....                      | 7625                           | 91.80                       | 102.82                      |
| Hague .....       | pound .....                      | 7625                           | 91.80                       | 102.82                      |
| Havre de Grace... | pound .....                      | 8161                           | 85.77                       | 96.06                       |
| Heidelberg .....  | pound .....                      | 7788                           | 89.88                       | 100.67                      |
| Hildesheim .....  | pound .....                      | 7207                           | 97.13                       | 108.79                      |
| Japan .....       | catti .....                      | 9100                           | 76.92                       | 86.15                       |
| Java .....        | catti .....                      | 9247                           | 75.70                       | 84.79                       |
| Kiel .....        | pound .....                      | 7355                           | 95.17                       | 106.69                      |
| Kintzingen .....  | pound .....                      | 7868                           | 88.97                       | 99.64                       |
| Konigsberg .....  | pound old weight ....            | 5869                           | 119.27                      | 133.58                      |
|                   | pound new weight ....            | 7233                           | 96.78                       | 108.50                      |
| Krems .....       | pound .....                      | 8743                           | 80.37                       | 89.67                       |
| Leghorn .....     | pound .....                      | 5296                           | 132.17                      | 148.03*                     |

\* According to the prices current received from Leghorn, the equivalent to 112 pounds is only 145.



## AVOIRDUPOIS WEIGHT.

| Places.         | Weights.                   | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|-----------------|----------------------------|--------------------------------|-----------------------------|-----------------------------|
|                 |                            | Grains.                        | Num. 100.                   | Num. 100.                   |
| Leipsic .....   | pound butchers' weight ..  | 7772                           | 90,07                       | 100,88                      |
|                 | pound commercial weight.   | 7207                           | 97,13                       | 108,79                      |
|                 | pound miners' weight....   | 6954                           | 100,66                      | 112,75                      |
|                 | pound for weighing steel . | 6718                           | 104,20                      | 116,70                      |
| Leyden .....    | pound .....                | 7261                           | 96,40                       | 107,97                      |
| Liebau .....    | pound .....                | 6378                           | 109,76                      | 122,92                      |
| Liege .....     | pound .....                | 7331                           | 95,48                       | 106,94                      |
| Lindau .....    | pound .....                | 7089                           | 98,74                       | 110,59                      |
| Lintz .....     | pound .....                | 8743                           | 80,07                       | 89,67                       |
| Lisbon .....    | pound .....                | 7085                           | 98,80                       | 110,66                      |
| Lisle .....     | pound heavy weight ....    | 7164                           | 97,72                       | 109,44                      |
|                 | pound light weight.....    | 6615                           | 105,81                      | 118,52                      |
| London .....    | pound avoirdupois .....    | 7000                           | 100,                        | 112,                        |
| Louvain .....   | pound .....                | 7261                           | 96,40                       | 107,97                      |
| Lubec .....     | pound .....                | 7461                           | 93,82                       | 105,08                      |
| Lucca .....     | pound commercial weight.   | 5745                           | 121,84                      | 136,45                      |
|                 | pound for weighing silk..  | 5150                           | 135,93                      | 152,24                      |
| Lucern .....    | pound .....                | 7707                           | 90,82                       | 101,72                      |
| Lunenburg.....  | pound .....                | 7494                           | 93,40                       | 104,61                      |
| Lyons .....     | pound for weighing silk .. | 7088                           | 98,77                       | 110,62                      |
|                 | pound city weight .....    | 6615                           | 105,81                      | 118,52                      |
| Madeira .....   | pound .....                | 6725                           | 104,10                      | 116,59                      |
| Madras.....     | maund .....                |                                | 4,                          | 4,48                        |
| Madrid.....     | pound .....                | 7102                           | 98,57                       | 110,40                      |
| Magdeburg ....  | pound .....                | 7232                           | 96,80                       | 108,42                      |
| Mahon .....     | pound .....                | 6865                           | 101,97                      | 114,21                      |
| Majorca .....   | rotolo .....               | 6846                           | 107,92                      | 120,87                      |
| Malabar .....   | vis .....                  | 23333                          | 30,                         | 33,59                       |
| Malacca .....   | vis .....                  | 9450                           | 74,08                       | 82,96                       |
| Malaga.....     | pound.....                 | 7102                           | 98,57                       | 110,40                      |
| Malta .....     | rotolo .....               | 11901                          | 58,82                       | 65,88                       |
| Manheim .....   | pound.....                 | 7639                           | 91,63                       | 102,63                      |
| Mantua .....    | pound.....                 | 5083                           | 137,71                      | 154,24                      |
| Marseilles .... | pound poids de table ....  | 6203                           | 112,85                      | 126,39                      |
| Masulipatam ... | seer.....                  | 4293                           | 163,05                      | 182,62                      |
| Mecca .....     | rotolo .....               | 7144                           | 97,98                       | 109,74                      |
| Medina .....    | rotolo .....               | 7144                           | 97,98                       | 109,74                      |
| Memel .....     | pound.....                 | 6378                           | 109,76                      | 122,92                      |
| Memmingen....   | pound.....                 | 7903                           | 88,57                       | 99,20                       |
| Messina .....   | pound of 12 ounces .....   | 4903                           | 142,77                      | 175,34                      |
|                 | rotolo of 30 ounces .....  | 12257                          | 57,11                       | 63,96                       |
|                 | rotolo of 33 ounces .....  | 13483                          | 51,92                       | 58,15                       |
| Middelburg .... | pound.....                 | 7225                           | 96,89                       | 108,52                      |



## AVOIRDUPOIS WEIGHT.

| Places.          | Weights.                   | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|------------------|----------------------------|--------------------------------|-----------------------------|-----------------------------|
|                  |                            | Grains.                        | Num. 100.                   | Num. 100.                   |
| Milan .....      | pound heavy weight .....   | 11807                          | 59,29                       | 66,40                       |
|                  | pound light weight .....   | 5060                           | 138,34                      | 154,94                      |
| Minorca .....    | libra mayor .....          | 18480                          | 37,88                       | 42,43                       |
|                  | libra menor .....          | 6160                           | 113,65                      | 127,28                      |
| Mocha .....      | maund .....                | 21000                          | 33,33                       | 37,33                       |
| Modena .....     | pound .....                | 4971                           | 140,82                      | 157,71                      |
| Monaco .....     | pound .....                | 5113                           | 136,89                      | 153,32                      |
| Montpellier .... | pound .....                | 6282                           | 111,42                      | 124,89                      |
| Morea.....       | pound commercial weight.   | 6168                           | 113,49                      | 127,10                      |
|                  | pound for weighing silk .. | 7710                           | 90,79                       | 101,68                      |
|                  | oke .....                  | 18463                          | 37,92                       | 42,47                       |
| Morocco .....    | pound of Castille .....    | 7102                           | 98,57                       | 110,40                      |
| Morlaix .....    | pound .....                | 7561                           | 92,58                       | 103,69                      |
| Muscovy .....    | pound .....                | 6314                           | 110,87                      | 124,18                      |
| Munich .....     | pound .....                | 8657                           | 80,86                       | 90,57                       |
| Munster .....    | pound .....                | 7355                           | 95,17                       | 106,60                      |
| Namur .....      | pound .....                | 7261                           | 96,40                       | 107,97                      |
| Nancy .....      | pound .....                | 7561                           | 92,58                       | 103,69                      |
| Nantes .....     | pound .....                | 7561                           | 92,58                       | 103,69                      |
| Naples .....     | pound .....                | 4954                           | 141,30                      | 158,26                      |
|                  | rotolo .....               | 13761                          | 50,87                       | 56,97                       |
| Narva .....      | pound .....                | 7225                           | 96,89                       | 108,52                      |
| Navarre .....    | pound of Castille.....     | 7102                           | 98,57                       | 110,40                      |
| Naumburg .....   | pound .....                | 7207                           | 97,13                       | 108,79                      |
| Negrepont ....   | rotolo .....               | 8261                           | 84,73                       | 94,90                       |
| Neufchatel ....  | pound .....                | 8029                           | 87,18                       | 97,64                       |
| Neustadt .....   | pound .....                | 7868                           | 88,97                       | 99,64                       |
| Nice.....        | pound .....                | 4786                           | 146,25                      | 163,80                      |
| Nimeguen .....   | pound .....                | 7639                           | 91,63                       | 102,63                      |
| Nordlingen ....  | pound .....                | 7566                           | 92,52                       | 103,62                      |
| Norway .....     | pound .....                | 7716                           | 90,72                       | 101,60                      |
| Novi.....        | pound .....                | 5113                           | 136,89                      | 153,32                      |
| Nuremberg ....   | pound .....                | 7868                           | 88,97                       | 99,64                       |
| Oporto .....     | pound Lisbon weight ....   | 7085                           | 98,80                       | 110,66                      |
|                  | pound according to Kruse.  | 6646                           | 105,33                      | 117,97                      |
| Oran.....        | rotolo .....               | 7776                           | 90,02                       | 100,83                      |
| Orient .....     | pound .....                | 7561                           | 92,58                       | 103,69                      |
| Ormuz .....      | seer .....                 | 4676                           | 149,70                      | 167,67                      |
| Osnaburg.....    | pound .....                | 7625                           | 91,80                       | 102,82                      |
| Ostend.....      | pound .....                | 7261                           | 96,40                       | 107,97                      |
| Oudenard .....   | pound .....                | 6758                           | 103,58                      | 116,                        |
| Oviedo.....      | pound of Asturias .....    | 10653                          | 65,71                       | 73,60                       |
|                  | pound of Castille .....    | 7102                           | 98,57                       | 110,40                      |



## AVOIRDUPOIS WEIGHT.

| Places.            | Weights.                   | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|--------------------|----------------------------|--------------------------------|-----------------------------|-----------------------------|
|                    |                            | Grains.                        | Num. 100.                   | Num. 100.                   |
| Paderborn .....    | pound .....                | 7355                           | 95,15                       | 106,60                      |
| Padua .....        | pound .....                | 5157                           | 135,77                      | 52,04                       |
| Palermo .....      | pound of 12 ounces ...     | 4903                           | 142,77                      | 7,34                        |
|                    | rotolo of 30 ounces .....  | 12257                          | 57,11                       | 63,96                       |
|                    | rotolo of 33 ounces .....  | 13483                          | 51,92                       | 58,15                       |
| Paris .....        | pound poids de marc ....   | 7561                           | 92,58                       | 103,69                      |
| Parma .....        | pound .....                | 5234                           | 133,75                      | 149,80                      |
| Passau .....       | pound .....                | 7414                           | 94,41                       | 105,74                      |
| Patras .....       | pound commercial weight.   | 6168                           | 113,49                      | 127,10                      |
|                    | pound for weighing silk .. | 7710                           | 90,79                       | 101,68                      |
| Pegu .....         | vis .....                  | 23333                          | 30,                         | 33,59                       |
| Pernau .....       | pound .....                | 6431                           | 108,85                      | 121,91                      |
| Piedmont .....     | pound .....                | 5749                           | 21,77                       | 136,39                      |
| Pisa .....         | pound .....                | 5028                           | 139,21                      | 155,92                      |
| Placenza .....     | pound .....                | 4980                           | 140,56                      | 157,43                      |
| Pondicherry .....  | vis .....                  | 22683                          | 30,86                       | 34,56                       |
| Portugal .....     | pound .....                | 7085                           | 98,80                       | 110,66                      |
| Posen .....        | pound .....                | 6148                           | 113,87                      | 127,53                      |
| Prague .....       | pound .....                | 7929                           | 88,28                       | 98,88                       |
| Presburg .....     | pound .....                | 8616                           | 81,24                       | 91,                         |
| Ragusa .....       | pound .....                | 5607                           | 124,84                      | 139,82                      |
| Ratisbon .....     | pound .....                | 8777                           | 79,75                       | 89,32                       |
| Ravenna .....      | pound .....                | 4623                           | 151,41                      | 169,58                      |
| Reggio .....       | pound .....                | 5093                           | 137,45                      | 153,95                      |
| Revel .....        | pound .....                | 6646                           | 105,33                      | 117,97                      |
| Rhodes .....       | rotolo .....               | 36922                          | 18,96                       | 21,24                       |
| Riga .....         | pound .....                | 6454                           | 108,40                      | 121,48                      |
| Rochelle .....     | pound .....                | 7561                           | 92,58                       | 103,69                      |
| Rome .....         | pound Roman .....          | 5239                           | 133,61                      | 149,65                      |
|                    | pound public scale .....   | 5344                           | 131,                        | 146,71                      |
| Rostock .....      | pound .....                | 7888                           | 88,75                       | 99,40                       |
| Rotenburg .....    | pound .....                | 7868                           | 88,97                       | 99,64                       |
| Rotterdam .....    | pound heavy weight ....    | 7625                           | 91,80                       | 102,82                      |
|                    | pound light weight .....   | 7261                           | 96,40                       | 107,97                      |
| Rouen .....        | pound poids de marc ....   | 7561                           | 92,58                       | 103,69                      |
|                    | pound poids de vicomté ..  | 8015                           | 87,34                       | 97,82                       |
| Roveredo .....     | pound .....                | 5257                           | 133,15                      | 149,13                      |
| Russia .....       | pound .....                | 6314                           | 110,87                      | 124,18                      |
| St. Ander .....    | pound .....                | 7102                           | 98,57                       | 110,40                      |
| St. Croix .....    | pound .....                | 7716                           | 90,72                       | 101,60                      |
| St. Eustatia ..... | pound .....                | 7625                           | 91,80                       | 102,82                      |
| St. Gall .....     | pound heavy weight .....   | 9823                           | 77,58                       | 86,89                       |
|                    | pound light weight .....   | 7179                           | 97,51                       | 109,21                      |



## AVOIRDUPOIS WEIGHT.

| Places.           | Weights.                      | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|-------------------|-------------------------------|--------------------------------|-----------------------------|-----------------------------|
|                   |                               | Grains.                        | Num. 100.                   | Num. 100.                   |
| St. Lucar .....   | pound .....                   | 7102                           | 98,57                       | 110,40                      |
| St. Malo .....    | pound .....                   | 7561                           | 92,58                       | 103,69                      |
| St. Petersburg .. | pound .....                   | 6314                           | 110,87                      | 124,18                      |
| St. Sebastian ..  | pound .....                   | 7524                           | 93,04                       | 104,20                      |
| Sallee .....      | pound .....                   | 7215                           | 97,01                       | 108,66                      |
| Saltzburg .....   | pound .....                   | 8643                           | 81,                         | 90,71                       |
| Saragossa .....   | pound of 12 ounces .....      | 5326                           | 131,43                      | 147,20                      |
| Sardinia .....    | pound .....                   | 6188                           | 113,12                      | 126,69                      |
| Sayd .....        | rotolo of Acre .....          | 36776                          | 19,04                       | 21,32                       |
|                   | rotolo of Damascus .....      | 28755                          | 24,34                       | 27,27                       |
| Schafhausen ..... | pound .....                   | 7094                           | 98,68                       | 110,52                      |
| Schweinfurt ..... | pound .....                   | 7868                           | 88,97                       | 99,64                       |
| Scio .....        | rotolo .....                  | 7647                           | 91,54                       | 102,52                      |
| Scotland .....    | pound old weight .....        | 7616                           | 91,91                       | 102,94                      |
|                   | pound new weight .....        | 7000                           | 100,                        | 112,                        |
| Seville .....     | pound .....                   | 7102                           | 98,57                       | 110,40                      |
| Siam .....        | catti .....                   | 9030                           | 77,52                       | 86,82                       |
| Sicily .....      | pound of 12 ounces .....      | 4903                           | 142,77                      | 175,34                      |
|                   | rotolo of 30 ounces .....     | 12257                          | 57,11                       | 63,96                       |
|                   | rotolo of 33 ounces .....     | 13483                          | 51,92                       | 58,15                       |
| Sienna .....      | pound .....                   | 6905                           | 101,38                      | 113,55                      |
| Smyrna .....      | oke .....                     | 19420                          | 36,05                       | 40,37                       |
|                   | rotolo .....                  | 8739                           | 80,10                       | 89,71                       |
| Spain .....       | pound of 16 ounces .....      | 7102                           | 98,57                       | 110,40                      |
| Stade .....       | pound .....                   | 7333                           | 95,46                       | 106,92                      |
| Stettin .....     | pound .....                   | 7232                           | 96,80                       | 108,42                      |
| Stralsund .....   | pound .....                   | 7461                           | 93,82                       | 105,08                      |
| Strasburg .....   | pound heavy weight .....      | 7557                           | 92,63                       | 103,75                      |
|                   | pound light weight .....      | 7277                           | 96,19                       | 107,74                      |
| Sweden .....      | pound victualie weight .....  | 6563                           | 106,66                      | 119,46                      |
|                   | pound miners' weight .....    | 5802                           | 120,65                      | 135,13                      |
|                   | pound cities weight .....     | 5526                           | 126,68                      | 141,88                      |
|                   | pound for weighing iron ..... | 5250                           | 133,33                      | 149,33                      |
|                   | pound apothecary weight ..... | 5501                           | 127,26                      | 142,53                      |
| Sumatra .....     | catti .....                   | 19684                          | 35,56                       | 39,83                       |
| Surat .....       | seer .....                    | 6556                           | 106,78                      | 119,60                      |
| Surinam .....     | pound .....                   | 7625                           | 91,80                       | 102,82                      |
| Syracuse .....    | pound .....                   | 5044                           | 138,78                      | 155,44                      |
| Syria .....       | mina .....                    | 9117                           | 76,78                       | 85,99                       |
| Tangier .....     | rotolo .....                  | 7426                           | 94,27                       | 105,58                      |
| Teneriff .....    | pound of Castille .....       | 7102                           | 98,57                       | 110,40                      |
| Tetuan .....      | rotolo .....                  | 10945                          | 63,96                       | 71,63                       |
| Thorn .....       | pound .....                   | 6502                           | 107,66                      | 120,58                      |



## AVOIRDUPOIS WEIGHT.

| Places.                           | Weights.                  | Contents<br>of each<br>weight. | Equiv.<br>to 100<br>pounds. | Equiv.<br>to 112<br>pounds. |
|-----------------------------------|---------------------------|--------------------------------|-----------------------------|-----------------------------|
|                                   |                           | Grains.                        | Num. 100.                   | Num. 100.                   |
| Toulon .....                      | pound .....               | 6633                           | 105,54                      | 118,20                      |
| Toulouse .....                    | pound .....               | 6418                           | 109,07                      | 122,15                      |
| Tournai .....                     | pound .....               | 6721                           | 104,15                      | 116,65                      |
| Treves .....                      | pound heavy weight .....  | 7975                           | 87,77                       | 98,31                       |
|                                   | pound light weight .....  | 5247                           | 133,41                      | 49,42                       |
| Trieste .....                     | pound Vienna weight ...   | 8650                           | 80,92                       | 90,64                       |
|                                   | lb. Venice great weight.. | 7384                           | 94,80                       | 106,18                      |
|                                   | lb. Venice small weight.. | 4673                           | 149,80                      | 167,78                      |
| Tripoli in Barbary                | rotolo .....              | 7850                           | 89,17                       | 99,87                       |
| Tripoli in Syria..                | rotolo .....              | 28037                          | 24,97                       | 27,96                       |
|                                   | oke .....                 | 18692                          | 37,45                       | 41,94                       |
| Tunis .....                       | rotolo .....              | 7661                           | 91,37                       | 102,34                      |
| Turin .....                       | pound .....               | 5696                           | 122,89                      | 137,63                      |
| Valencia .....                    | pound of 12 ounces .....  | 5498                           | 127,32                      | 142,60                      |
|                                   | pound of 16 ounces .....  | 7331                           | 95,48                       | 106,94                      |
|                                   | pound of 18 ounces .....  | 8247                           | 84,88                       | 95,07                       |
| Valenciennes ...                  | pound .....               | 7259                           | 96,43                       | 108,                        |
| Venice .....                      | pound great weight .....  | 7384                           | 94,80                       | 106,18                      |
|                                   | pound small weight .....  | 4673                           | 149,80                      | 167,78                      |
| Verona .....                      | pound great weight .....  | 7677                           | 91,18                       | 102,12                      |
|                                   | pound small weight .....  | 5136                           | 136,30                      | 152,65                      |
| Vicenza .....                     | pound great weight .....  | 7523                           | 93,05                       | 104,21                      |
|                                   | pound small weight .....  | 5247                           | 133,41                      | 149,42                      |
| Vienna .....                      | pound .....               | 8650                           | 80,92                       | 90,64                       |
| Ulm .....                         | pound .....               | 7234                           | 96,76                       | 108,37                      |
| United States of<br>America ..... | pound .....               | 7000                           | 100,                        | 112,                        |
| Warsaw .....                      | pound .....               | 5853                           | 119,60                      | 133,95                      |
| Wismar .....                      | pound .....               | 7471                           | 93,70                       | 104,94                      |
| Windaw .....                      | pound .....               | 6377                           | 109,76                      | 122,23                      |
| Wirtemberg ....                   | pound .....               | 7225                           | 96,89                       | 108,52                      |
| Wurtzburg .....                   | pound .....               | 7362                           | 95,08                       | 106,49                      |
| Ypres .....                       | pound .....               | 6646                           | 105,33                      | 117,97                      |
| Zante .....                       | pound .....               | 7384                           | 94,80                       | 106,18                      |
| Zealand .....                     | pound .....               | 7172                           | 97,60                       | 109,32                      |
| Zell .....                        | pound .....               | 7494                           | 93,40                       | 104,61                      |
| Zittau .....                      | pound .....               | 7221                           | 96,94                       | 108,57                      |
| Zurich .....                      | pound heavy weight .....  | 8138                           | 86,01                       | 96,33                       |
|                                   | pound light weight .....  | 7234                           | 96,76                       | 108,37                      |
| Zutphen .....                     | pound .....               | 7259                           | 96,43                       | 108,                        |
| Zwoll .....                       | pound .....               | 7439                           | 94,10                       | 105,39                      |

The following Examples will shew in what manner the proportion between the weights of any two given countries may be ascertained.



It is required to reduce 100 kilogrammes of France into pounds of Amsterdam.

The kilogramme of France weighing 15446 grains, and the pound of Amsterdam 7625, according to the table prefixed, I state the following equation :

$$\begin{aligned}
 100 \text{ kilogrammes} &= x \\
 1 \text{ kilogramme} &= 15446 \text{ grains} \\
 7625 \text{ grains} &= 1 \text{ pound} \\
 \text{Result } 202,57 \text{ pounds.}
 \end{aligned}$$

Reduce 100 pounds of Amsterdam into kilogrammes of France.

$$\begin{aligned}
 100 \text{ pounds} &= x \\
 1 \text{ pound} &= 7625 \text{ grains} \\
 15446 \text{ grains} &= 1 \text{ kilogramme.} \\
 \text{Result } 49,37 \text{ kilogrammes.}
 \end{aligned}$$

The following Examples will serve to assist in the proper reduction of the weights of any two given countries may be seen.



## TABLE VI.

*The Quantity of English Cubic Inches contained by each of the Corn Measures, and the Relation of Foreign Measures to 10 Quarters Winchester Measure.*

## CORN MEASURE.

| Places.               | Measures.      | Contents<br>of each<br>measure. | Equiv. to<br>10<br>quarters. |
|-----------------------|----------------|---------------------------------|------------------------------|
|                       |                | Cubic in.                       | Num. 100.                    |
| Abbeville .....       | setier .....   | 9355                            | 8,63                         |
| Agen .....            | sac .....      | 5332                            | 32,68                        |
| Aire .....            | raziere .....  | 6136                            | 28,40                        |
| Aix la Chapelle ..... | fas .....      | 1460                            | 119,35                       |
| Alckmaar .....        | sack .....     | 4938                            | 35,29                        |
| Alexandria .....      | rebebe .....   | 9578                            | 18,19                        |
|                       | kisloz .....   | 10407                           | 16,74                        |
| Algiers .....         | caffise .....  | 19485                           | 8,94                         |
| Alicante .....        | caffise .....  | 14901                           | 11,69                        |
| Amersfort .....       | mudden .....   | 13986                           | 15,68                        |
| Amiens .....          | setier .....   | 2003                            | 87,                          |
| Amsterdam .....       | last .....     | 177916                          | ,98                          |
|                       | mudden .....   | 6590                            | 26,44                        |
|                       | sack .....     | 4942                            | 35,26                        |
|                       | scheepel ..... | 1647                            | 105,77                       |
| Ancona .....          | rubbo .....    | 16645                           | 10,47                        |
| Antwerp .....         | viertel .....  | 4701                            | 37,07                        |
| Apenrade .....        | tonen .....    | 8355                            | 20,85                        |
| Archangel .....       | czeitwer ..... | 11888                           | 14,66                        |
| Arensburg .....       | last .....     | 187262                          | ,93                          |
| Arles .....           | setier .....   | 3628                            | 48,03                        |
| Arnheim .....         | mouwer .....   | 8080                            | 21,56                        |
| Augsburg .....        | schaf .....    | 26787                           | 6,50                         |
| Avignon .....         | boisseau ..... | 5612                            | 31,05                        |
| Avila .....           | fanega .....   | 3311                            | 52,62                        |
| Azores .....          | alquier .....  | 730                             | 238,54                       |
| Barcelona .....       | quartera ..... | 4238                            | 41,11                        |
| Basil .....           | sack .....     | 7866                            | 22,15                        |
| Bautzen .....         | scheffel ..... | 6657                            | 26,17                        |
| Bayonne .....         | conque .....   | 2503                            | 69,61                        |
| Beaucaire .....       | setier .....   | 3703                            | 47,05                        |
| Beauvais .....        | tonneau .....  | 118529                          | 1,47                         |
| Bergamo .....         | staja .....    | 1263                            | 138,                         |
| Bergen op Zoom .....  | sister .....   | 2818                            | 61,83                        |
| Berlin .....          | scheffel ..... | 3315                            | 52,26                        |
| Bern .....            | mutte .....    | 9650                            | 18,06                        |
| Bilboa .....          | fanega .....   | 3510                            | 49,64                        |



## CORN MEASURE.

| Places.              | Measures               | Contents<br>of each<br>measure. | Equiv. to<br>10<br>quarters. |
|----------------------|------------------------|---------------------------------|------------------------------|
|                      |                        | Cubic in.                       | Num. 100.                    |
| Bois-le-Duc .....    | mouver .....           | 8671                            | 20,09                        |
| Bologna .....        | corba .....            | 4499                            | 38,73                        |
| Bordeaux .....       | boisseau .....         | 4678                            | 37,25                        |
| Boulogne .....       | setier .....           | 10525                           | 16,55                        |
| Breda .....          | viertel .....          | 5306                            | 32,84                        |
| Bremen .....         | scheffel .....         | 4336                            | 40,19                        |
| Breslau .....        | scheffel .....         | 4262                            | 40,89                        |
| Brest .....          | tonneau .....          | 84200                           | 2,07                         |
| Briel .....          | sœcke .....            | 4380                            | 39,78                        |
| Bruges .....         | hoeden .....           | 10157                           | 17,15                        |
| Brunswick .....      | scheffel .....         | 18963                           | 9,19                         |
| Brussels .....       | sack .....             | 7110                            | 24,51                        |
| Cadiz .....          | fanega .....           | 3311                            | 52,67                        |
| Calabria .....       | tomolo .....           | 3119                            | 55,87                        |
| Calais .....         | setier .....           | 10134                           | 17,19                        |
| Campan .....         | mudden .....           | 7137                            | 24,41                        |
| Candia .....         | carga .....            | 9356                            | 18,62                        |
| Cassel .....         | viertel .....          | 8702                            | 20,02                        |
| Castille .....       | fanega .....           | 3311                            | 52,67                        |
| Cleves .....         | malter .....           | 10939                           | 15,93                        |
| Coburg .....         | simmer .....           | 5079                            | 34,31                        |
| Colberg .....        | scheffel .....         | 3029                            | 57,52                        |
| Cologne .....        | malter .....           | 9883                            | 17,63                        |
| Concarneau .....     | tonneau .....          | 84200                           | 2,07                         |
| Constantinople ..... | kisloz .....           | 2140                            | 81,40                        |
| Copenhagen .....     | tœnde .....            | 8481                            | 20,54                        |
| Corfu .....          | moggio .....           | 6091                            | 28,61                        |
| Corsica .....        | stajo .....            | 6008                            | 29,                          |
| Corunna .....        | ferrado .....          | 986                             | 176,71                       |
| Creutznach .....     | malter .....           | 8874                            | 19,63                        |
| Cyprus .....         | medimno .....          | 4448                            | 39,17                        |
| Dantzic .....        | last .....             | 187310                          | ,93                          |
|                      | scheffel Berlinmeasure | 3315                            | 52,26                        |
| Darmstadt .....      | malter .....           | 6107                            | 28,53                        |
| Delft .....          | sack .....             | 6129                            | 28,43                        |
| Denmark .....        | tœnde .....            | 8481                            | 20,54                        |
| Deventer .....       | mudden .....           | 4938                            | 35,29                        |
| Dieppe .....         | raziere .....          | 6237                            | 27,94                        |
| Dixmude .....        | raziere .....          | 5828                            | 29,90                        |
| Dordrecht .....      | sack .....             | 7406                            | 23,53                        |
| Dresden .....        | scheffel .....         | 6455                            | 27,                          |
| Dunkirk .....        | sea raziere .....      | 9875                            | 17,64                        |
|                      | land raziere .....     | 8887                            | 19,61                        |
| Eckrenforde .....    | tonnen .....           | 8242                            | 21,14                        |



## CORN MEASURE.

| Places.                         | Measures.              | Contents<br>of each<br>measure. | Equiv.<br>to 10<br>quarters. |
|---------------------------------|------------------------|---------------------------------|------------------------------|
|                                 |                        | Cubic in.                       | Num. 100.                    |
| Edam .....                      | mudden .....           | 6590                            | 26,44                        |
| Elbing .....                    | last .....             | 187310                          | ,93                          |
| Embden .....                    | tonnen .....           | 11656                           | 14,95                        |
| Enchuysen .....                 | mudden .....           | 8080                            | 21,56                        |
| England .....                   | quarter .....          | 17424                           | 10,                          |
|                                 | bushel .....           | 2178                            | 80,                          |
| Erfurt .....                    | scheffel .....         | 3430                            | 50,80                        |
| Femerén .....                   | scheffel .....         | 2294                            | 75,95                        |
| Ferrara .....                   | staro .....            | 1843                            | 94,54                        |
| Ferrol .....                    | ferrado .....          | 1104                            | 157,83                       |
| Flensburg .....                 | tonnen .....           | 8355                            | 20,85                        |
| Florence .....                  | stajo .....            | 1444                            | 120,67                       |
| France .....                    | boisseau of Paris .... | 774                             | 225,13                       |
|                                 | décalitre* .....       | 610                             | 285,64                       |
| Frankfort on the<br>Maine ..... | malter .....           | 6584                            | 26,46                        |
| Frederickstadt .....            | tonnen .....           | 7708                            | 22,60                        |
| Gand .....                      | halster .....          | 3175                            | 54,89                        |
| Geneva .....                    | coupe .....            | 4735                            | 36,80                        |
| Genoa .....                     | mina .....             | 7110                            | 24,51                        |
| Gluckstadt .....                | tonnen .....           | 8716                            | 20,                          |
| Goes .....                      | sack .....             | 4444                            | 39,21                        |
| Gorcum .....                    | mudden .....           | 10305                           | 16,91                        |
| Gouda .....                     | sack .....             | 6348                            | 27,45                        |
| Granada .....                   | sack .....             | 5924                            | 29,41                        |
| Gravelines .....                | raziere .....          | 8080                            | 21,56                        |
| Grypswald .....                 | scheffel .....         | 2375                            | 73,36                        |
| Groningen .....                 | mudden .....           | 5386                            | 32,35                        |
| Haarlem .....                   | sack .....             | 4678                            | 37,25                        |
| Hamburg .....                   | last .....             | 192720                          | ,90 $\frac{2}{3}$            |
|                                 | sack .....             | 12848                           | 13,56                        |
|                                 | scheffel .....         | 6424                            | 27,12                        |
|                                 | tonnen salt measure .  | 11428                           | 15,25                        |
| Hanau .....                     | malter .....           | 6862                            | 25,39                        |
| Hanover .....                   | himten .....           | 1896                            | 91,89                        |
| Harderwyck .....                | mudden .....           | 5954                            | 29,26                        |
| Harlingen .....                 | mudden .....           | 5386                            | 32,35                        |
| Havre de Grace ....             | boisseau .....         | 2108                            | 82,66                        |
| Heidelberg .....                | malter .....           | 6279                            | 27,75                        |
| Heusden .....                   | mudden .....           | 10305                           | 16,91                        |
| Hildesheim .....                | himten .....           | 1581                            | 110,23                       |
| Holstein .....                  | himten .....           | 2007                            | 86,82                        |

\* The litre, or the unit of French measures of capacity, is therefore equivalent to 61 English cubic inches.



## CORN MEASURE.

| Places.           | Measures.              | Contents<br>of each<br>measure. | Equiv. to<br>10<br>quarters. |
|-------------------|------------------------|---------------------------------|------------------------------|
|                   |                        | Cubic in.                       | Num. 100.                    |
| Honfleur .....    | boisseau .....         | 2390                            | 72,91                        |
| Horn .....        | sack .....             | 4039                            | 43,13                        |
| Husum .....       | tonnen .....           | 8924                            | 19,52                        |
| Kiel .....        | tonnen .....           | 7227                            | 24,11                        |
| Konigsberg .....  | scheffel new measure.  | 3315                            | 52,26                        |
| Laland .....      | tonnen ..              | 8380                            | 20,79                        |
| Leghorn .....     | sacco .....            | 4332                            | 40,22                        |
|                   | stajo .....            | 1444                            | 120,67                       |
| Leipsic .....     | scheffel .....         | 8473                            | 20,56                        |
| Lewarden .....    | mudden .....           | 5386                            | 32,35                        |
| Liebau .....      | loof .....             | 3819                            | 45,62                        |
| Libourne .....    | sac .....              | 5079                            | 34,31                        |
| Liege .....       | setier .....           | 1825                            | 95,48                        |
| Lisbon .....      | moyo .....             | 49440                           | 3,52                         |
|                   | alquier .....          | 824                             | 211,46                       |
| Lisle .....       | raziere .....          | 4334                            | 40,20                        |
| London .....      | quarter .....          | 17424                           | 10,                          |
| Lubec .....       | last corn measure ...  | 195500                          | ,891 <sub>8</sub>            |
|                   | scheffel rye measure . | 2037                            | 85,54                        |
|                   | scheffel malt measure. | 2375                            | 73,36                        |
|                   | scheffel oats measure. | 2392                            | 72,84                        |
| Lucca .....       | stajo .....            | 1495                            | 116,55                       |
| Lunenburg .....   | scheffel .....         | 3793                            | 45,94                        |
| Lyons .....       | anée .....             | 12538                           | 13,90                        |
| Madeira .....     | alquier .....          | 683                             | 255,11                       |
| Magdeburg .....   | scheffel .....         | 3315                            | 52,56                        |
| Majorca .....     | quartera .....         | 4139                            | 42,10                        |
| Malaga .....      | fanega .....           | 3642                            | 47,84                        |
| Malta .....       | salma .....            | 10240                           | 10,73                        |
| Manfredonia ..... | carro .....            | 114634                          | 1,52                         |
| Manheim .....     | malter .....           | 6279                            | 27,75                        |
| Mantua .....      | stajo .....            | 2124                            | 82,04                        |
| Marans .....      | tonneau .....          | 84200                           | 2,07                         |
| Marseilles .....  | charge .....           | 9636                            | 18,08                        |
| Mastriek .....    | setier .....           | 1382                            | 126,08                       |
| Meissen .....     | scheffel .....         | 6455                            | 27,                          |
| Memel .....       | scheffel .....         | 3315                            | 52,26                        |
| Middleburg .....  | sack .....             | 4284                            | 40,67                        |
| Milan .....       | moggio .....           | 8436                            | 20,66                        |
| Modena .....      | stajo .....            | 4284                            | 40,67                        |
| Montpellier ..... | setier .....           | 3119                            | 55,86                        |
| Montreuil .....   | boisseau .....         | 520                             | 335,08                       |
| Morlaix .....     | boisseau .....         | 3229                            | 53,96                        |
| Munich .....      | schaff .....           | 22109                           | 7,88                         |



## CORN MEASURE.

| Places.               | Measures.                   | Contents<br>of each<br>measure. | Equiv. to<br>10<br>quarters. |
|-----------------------|-----------------------------|---------------------------------|------------------------------|
|                       |                             | Cubic in.                       | Num. 100.                    |
| Muyden .....          | mudden .....                | 8080                            | 21,56                        |
| Nancy .....           | carte .....                 | 2921                            | 59,65                        |
| Nantes .....          | tonneau .....               | 152510                          | 1,14 $\frac{1}{2}$           |
|                       | setier .....                | 15251                           | 11,42 $\frac{1}{2}$          |
| Naples .....          | tomolo .....                | 3182                            | 54,76                        |
| Narva .....           | tonnen .....                | 9883                            | 17,63                        |
| Neda in Galicia ..... | ferrado .....               | 1104                            | 157,83                       |
| Negropont .....       | kisloz .....                | 1849                            | 94,23                        |
| Nieuport .....        | raziere .....               | 10157                           | 17,15                        |
| Nimeguen .....        | mrouver .....               | 8173                            | 21,32                        |
| Nice .....            | stajo .....                 | 2349                            | 74,18                        |
| Nuremberg .....       | summer .....                | 20287                           | 8,59                         |
| Oesel .....           | last .....                  | 187260                          | ,93                          |
| Oporto .....          | alquier .....               | 1006                            | 173,20                       |
| Osnaburg .....        | scheffel .....              | 1750                            | 99,57                        |
| Ostend .....          | raziere .....               | 10706                           | 16,27                        |
| Oudenwater .....      | mudden .....                | 8465                            | 20,58                        |
| Oviedo .....          | fanega .....                | 4415                            | 39,47                        |
| Paris .....           | setier .....                | 9288                            | 18,76                        |
|                       | boisseau .....              | 774                             | 225,13                       |
|                       | decalitre .....             | 610                             | 285,64                       |
| Passau .....          | sechsling .....             | 19465                           | 8,95                         |
| Patras .....          | staro .....                 | 5006                            | 34,81                        |
| Pernau .....          | loof .....                  | 3974                            | 43,85                        |
| Persia .....          | artaba .....                | 3974                            | 43,85                        |
| Piedmont .....        | sack .....                  | 6489                            | 26,85                        |
| Poland .....          | last .....                  | 187260                          | ,93                          |
| Prague .....          | strick .....                | 5755                            | 30,28                        |
| Purmerend .....       | mudden .....                | 6590                            | 26,44                        |
| Ratisbon .....        | metzen .....                | 2001                            | 87,08                        |
| Ravenna .....         | rubbo .....                 | 16984                           | 10,26                        |
| Rendsburg .....       | tonnen .....                | 7558                            | 23,05                        |
| Revel .....           | tonnen .....                | 7212                            | 24,16                        |
| Riga .....            | tonnen .....                | 7948                            | 21,92                        |
|                       | loof .....                  | 3974                            | 43,85                        |
| Rimini .....          | rubbo .....                 | 16984                           | 10,26                        |
| Rochelle .....        | tonneau .....               | 84200                           | 2,07                         |
| Romagna .....         | staro .....                 | 5506                            | 31,64                        |
| Rome .....            | rubbo .....                 | 16684                           | 10,44                        |
| Rostock .....         | scheffelwheat measure ..... | 2450                            | 71,12                        |
|                       | scheffeloats measure .....  | 2723                            | 63,99                        |
| Rotterdam .....       | hoed .....                  | 67755                           | 2,57                         |
|                       | sakken .....                | 6352                            | 27,43                        |
|                       | achtendeelen .....          | 2117                            | 82,31                        |



## CORN MEASURE.

| Places.              | Measures.              | Contents<br>of each<br>measure. | Equiv. to<br>10<br>quarters. |
|----------------------|------------------------|---------------------------------|------------------------------|
|                      |                        | Cubic in.                       | Num. 100.                    |
| Rouen .....          | setier .....           | 10904                           | 15,98                        |
|                      | boisseau .....         | 1363                            | 127,83                       |
| Russia .....         | chetwer .....          | 11888                           | 14,66                        |
|                      | chetwerick .....       | 1486                            | 117,25                       |
| St. Ander .....      | fanega .....           | 3311                            | 52,67                        |
| St. Gall .....       | charge .....           | 4443                            | 39,22                        |
| St. Malo .....       | tonneau .....          | 84200                           | 2,07                         |
| St. Omer .....       | raziere .....          | 7900                            | 22,07                        |
| St. Petersburg ..... | chetwer .....          | 11888                           | 14,66                        |
|                      | chetwerick .....       | 1486                            | 117,25                       |
| St. Sebastian .....  | fanega .....           | 3311                            | 52,67                        |
| St. Valery .....     | setier .....           | 9356                            | 18,62                        |
| Sardinia .....       | starello .....         | 2988                            | 58,31                        |
| Schiedam .....       | sack .....             | 6352                            | 27,43                        |
| Schleswig .....      | tonnen .....           | 8012                            | 21,75                        |
| Schonhoven .....     | mudden .....           | 8465                            | 20,58                        |
| Scotland .....       | firlot wheat measure.  | 2197                            | 79,31                        |
|                      | firlot barley measure. | 3207                            | 54,33                        |
| Seville .....        | fanega .....           | 3311                            | 52,67                        |
| Sicily .....         | salma grossa .....     | 20215                           | 8,62                         |
|                      | salma generale .....   | 16229                           | 10,74                        |
| Smyrna .....         | quillot .....          | 2141                            | 81,38                        |
| Spain .....          | fanega .....           | 3311                            | 52,67                        |
|                      | celemine .....         | 276                             | 631,30                       |
| Stettin .....        | scheffel .....         | 2677                            | 65,09                        |
| Stralsund .....      | scheffel wheat measure | 2609                            | 66,78                        |
|                      | scheffel oats measure. | 2768                            | 62,95                        |
| Strasbourg .....     | sester city measure .. | 1117                            | 156,                         |
|                      | sester country measure | 1152                            | 151,25                       |
| Sweden .....         | tunna .....            | 8932                            | 19,51                        |
|                      | tunna wheat measure.   | 10050                           | 17,34                        |
|                      | tunna malt measure ..  | 10607                           | 16,43                        |
|                      | tunna salt measure ..  | 9491                            | 18,36                        |
|                      | kappe .....            | 279                             | 624,53                       |
|                      | kanna .....            | 159 $\frac{1}{2}$               | 1092,42                      |
| Tarascon .....       | charge .....           | 3485                            | 50,                          |
| Tarragona .....      | setier .....           | 3442                            | 50,62                        |
| Tervere .....        | sack .....             | 4557                            | 38,24                        |
| Tiel .....           | mudden .....           | 8465                            | 20,58                        |
| Tonningen .....      | tonnen .....           | 7406                            | 23,53                        |
| Tortosa .....        | quartera .....         | 5414                            | 32,18                        |
| Toulon .....         | emine .....            | 6237                            | 27,94                        |
| Tuscany .....        | moggio .....           | 32480                           | 5,36 $\frac{1}{2}$           |
| Trieste .....        | staro .....            | 4517                            | 38,57                        |



## CORN MEASURE.

| Places.            | Measures.       | Contents<br>of each<br>measure.<br>—<br>Cubic in. | Equiv. to<br>10<br>quarters.<br>—<br>Num. 100. |
|--------------------|-----------------|---------------------------------------------------|------------------------------------------------|
| Tripoli.....       | caffise.....    | 19920                                             | 8,75                                           |
| Tunis .....        | caffise.....    | 21830                                             | 7,98                                           |
| Turin .....        | emine .....     | 1168                                              | 149,18                                         |
| Ulm .....          | metzen .....    | 584                                               | 298,26                                         |
| Utrecht .....      | mudden .....    | 7110                                              | 24,50                                          |
| Valencia .....     | cahiz .....     | 12227                                             | 14,25                                          |
|                    | barchilla ..... | 1019                                              | 171,                                           |
| Valenciennes ..... | mytur .....     | 4380                                              | 39,78                                          |
| Vannes.....        | tonneau .....   | 93556                                             | 1,86                                           |
| Venice .....       | staro.....      | 4941                                              | 35,27                                          |
| Verona .....       | minella.....    | 2248                                              | 77,51                                          |
| Viana .....        | alquier .....   | 989                                               | 176,18                                         |
| Vienna .....       | metzen .....    | 4277                                              | 40,74                                          |
| Weimar .....       | scheffel.....   | 5430                                              | 32,09                                          |
| Wetzlar .....      | malter .....    | 14275                                             | 12,20                                          |
| Windaw .....       | loof .....      | 3819                                              | 45,62                                          |
| Wirtemberg.....    | scheffel.....   | 3228                                              | 53,98                                          |
| Wismar .....       | scheffel.....   | 2496                                              | 69,81                                          |
| Wolgast .....      | scheffel.....   | 2609                                              | 66,78                                          |
| Zante .....        | bazzilo .....   | 2165                                              | 80,48                                          |
| Zell.....          | scheffel .....  | 18963                                             | 9,19                                           |
| Ziriczee .....     | sack .....      | 4741                                              | 36,75                                          |
| Zuric .....        | mutte .....     | 5043                                              | 34,55                                          |
| Zwickau .....      | scheffel .....  | 4089                                              | 42,61                                          |
| Zwoll .....        | sack .....      | 6836                                              | 25,49                                          |

The following Examples will shew in what manner the proportion between the measures of any two given countries may be ascertained.

It is required to reduce 100 alquiers of Lisbon into fanegas of Cadiz.

The alquier containing 824 cubic inches, and the fanega 3311, according to the table prefixed, I state the following equation :

$$\begin{array}{rcl}
 100 \text{ alquiers} & = & x \\
 1 \text{ alquier} & = & 824 \text{ cubic inches} \\
 3311 \text{ cubic inches} & = & 1 \text{ fanega} \\
 & & \text{Result 24,89 fanegas.}
 \end{array}$$

Reduce 100 fanegas of Cadiz into alquiers of Lisbon.

$$\begin{array}{rcl}
 100 \text{ fanegas} & = & x \\
 1 \text{ fanega} & = & 3311 \text{ cubic inches} \\
 824 \text{ cubic inches} & = & 1 \text{ alquier} \\
 & & \text{Result 401,82 alquiers.}
 \end{array}$$



## TABLE VII.

The Quantity of English Cubic Inches contained by each of the Measures used in the Sale of Liquids, and the Relation of Foreign Measures to 100 English Gallons Wine Measure.

## LIQUID MEASURE.

| Places.            | Measures.               | Contents<br>of each<br>measure. | Equiv. to<br>100<br>gallons. |
|--------------------|-------------------------|---------------------------------|------------------------------|
|                    |                         | Cubic in.                       | Num. 100.                    |
| Alicante .....     | cantara .....           | 622                             | 37,14                        |
| Altona .....       | tonne of 32 stubgens... | 7067                            | 3,27                         |
| Amsterdam .....    | stekan .....            | 1160                            | 19,91                        |
|                    | viertel .....           | 442 $\frac{1}{2}$               | 52,20                        |
|                    | stoopen .....           | 145                             | 159,31                       |
|                    | mingel .....            | 72 $\frac{1}{2}$                | 318,62                       |
|                    | boccale .....           | 87                              | 265,51                       |
| Ancona .....       | stoopen .....           | 192 $\frac{1}{4}$               | 120,15                       |
| Antwerp .....      | cantara .....           | 585                             | 39,49                        |
| Arragon .....      | maas .....              | 90 $\frac{1}{3}$                | 255,72                       |
| Augsburg .....     | carga wine measure....  | 7599                            | 3,04                         |
| Barcelona .....    | carga oil measure....   | 7394                            | 3,12                         |
|                    | salm oil measure....    | 10086                           | 2,29                         |
| Bari .....         | pot new measure....     | 76 $\frac{1}{3}$                | 303,15                       |
| Basil .....        | nass or maas .....      | 70 $\frac{1}{8}$                | 329,41                       |
| Berlin .....       | maas .....              | 100 $\frac{1}{2}$               | 229,85                       |
| Bern .....         | corba .....             | 4450                            | 5,13                         |
| Bolgona .....      | velte .....             | 453                             | 51,                          |
| Bordeaux .....     | stubgen .....           | 193 $\frac{1}{2}$               | 119,38                       |
| Bremen .....       | quart .....             | 42 $\frac{1}{3}$                | 545,67                       |
| Breslau .....      | stubgen .....           | 223 $\frac{3}{4}$               | 103,24                       |
| Brunswick .....    | see Spain               |                                 |                              |
| Cadiz .....        | pipa .....              | 26794                           | ,86                          |
| Canary Islands ... | miscala oil measure ... | 686                             | 33,67                        |
| Canea .....        | viertel .....           | 499 $\frac{1}{2}$               | 46,25                        |
| Cassel ..          | velte .....             | 447 $\frac{1}{2}$               | 51,62                        |
| Cognac .....       | viertel .....           | 365                             | 63,29                        |
| Cologne .....      | almud .....             | 319 $\frac{1}{4}$               | 72,36                        |
| Constantinople ... | stof wine measure....   | 104 $\frac{3}{5}$               | 220,84                       |
| Dantzic .....      | stof beer measure ..... | 140 $\frac{1}{4}$               | 164,70                       |
|                    | ahm .....               | 9128                            | 2,53                         |
|                    | kanne wine measure ...  | 117 $\frac{3}{4}$               | 196,18                       |
|                    | tøende beer measure ... | 8011                            | 2,88                         |
|                    | tøende pitch measure .. | 7067                            | 3,27                         |
| Dijon .....        | quartaut .....          | 6176                            | 3,74                         |
| Dresden .....      | anker regular measure.  | 2055                            | 11,24                        |
|                    | tonne beer measure ...  | 5993                            | 3,85                         |



## LIQUID MEASURE.

| Places.                      | Measures.                | Contents<br>of each<br>measure. | Equiv. to<br>100<br>gallons. |
|------------------------------|--------------------------|---------------------------------|------------------------------|
|                              |                          | Cubic in.                       | Num. 100.                    |
| Dresden ( <i>continued</i> ) | kanen great measure....  | 85 $\frac{5}{8}$                | 269,79                       |
|                              | kanen small measure....  | 57                              | 405,27                       |
| Dunkirk.....                 | pot .....                | 138                             | 167,39                       |
| England.....                 | gallon wine measure....  | 231                             | 100,                         |
|                              | gallon beer measure....  | 282                             | 81,91                        |
| Ferrara .....                | secchia .....            | 624                             | 37,02                        |
| Florence .....               | barile oil measure....   | 1940                            | 11,91                        |
|                              | barile wine measure....  | 2425                            | 9,53                         |
|                              | fiasco .....             | 121                             | 190,90                       |
|                              | boccale .....            | 60 $\frac{1}{2}$                | 381,80                       |
| France .....                 | hectolitre.....          | 6100                            | 3,79                         |
|                              | litre .....              | 61                              | 378,69                       |
| Frankfort on the             |                          |                                 |                              |
| Maine .....                  | viertel .....            | 450                             | 51,33                        |
| Gallipoli .....              | salma .....              | 9392                            | 2,46                         |
| Geneva .....                 | pot .....                | 58                              | 398,27                       |
| Genoa .....                  | rubbo oil measure....    | 521                             | 44,34                        |
|                              | pinta wine measure....   | 105                             | 220,                         |
| Gotha .....                  | stubgen .....            | 206 $\frac{3}{4}$               | 111,73                       |
| Hamburg .....                | viertel .....            | 442                             | 52,26                        |
|                              | stubgen .....            | 221                             | 104,52                       |
|                              | kanne .....              | 110 $\frac{1}{2}$               | 209,05                       |
|                              | tonne beer measure....   | 10594                           | 2,18                         |
|                              | tonne fish oil measure.. | 7062                            | 3,27                         |
| Hanover .....                | stubgen .....            | 237                             | 97,47                        |
|                              | tonne beer measure....   | 6163                            | 3,75                         |
|                              | tonne honey measure....  | 6044                            | 3,82                         |
| Heidelberg .....             | viertel .....            | 562 $\frac{1}{4}$               | 41,08                        |
| Hungaria .....               | eimer .....              | 4470                            | 5,17                         |
| Konigsberg .....             | stof .....               | 87 $\frac{1}{2}$                | 264,                         |
| Leghorn.....                 | barile oil measure....   | 1940                            | 11,91                        |
|                              | barile wine measure....  | 2425                            | 9,53                         |
|                              | fiasco .....             | 121                             | 190,90                       |
|                              | boccale .....            | 60 $\frac{1}{2}$                | 381,80                       |
| Leipsic.....                 | eimer .....              | 4625                            | 5,00                         |
|                              | kanne .....              | 73 $\frac{2}{3}$                | 314,71                       |
| Lisle .....                  | lot .....                | 128                             | 180,47                       |
| Lisbon .....                 | almude.....              | 1040                            | 22,21                        |
|                              | alquier .....            | 520                             | 44,42                        |
|                              | canhada .....            | 86 $\frac{2}{3}$                | 266,54                       |
| Lubec .....                  | stubgen .....            | 220 $\frac{3}{4}$               | 104,65                       |
| Lucca .....                  | copa oil measure....     | 6088                            | 3,79                         |
| Lyons.....                   | pot.....                 | 58 $\frac{1}{10}$               | 397,62                       |
| Majorca.....                 | cortan oil measure....   | 251 $\frac{5}{8}$               | 91,80                        |
| Malaga.....                  | arroba .....             | 947                             | 24,39                        |



## LIQUID MEASURE.

| Places.           | Measures.                | Contents<br>of each<br>measure. | Equiv. to<br>100<br>gallons. |
|-------------------|--------------------------|---------------------------------|------------------------------|
|                   |                          | Cubic in.                       | Num. 100.                    |
| Mantua .....      | moggio oil measure....   | 6789                            | 3,40                         |
| Marseilles .....  | millerolle .....         | 3640                            | 6,35                         |
| Massa .....       | scandal .....            | 910                             | 25,38                        |
| Mentz .....       | barile oil measure....   | 2160                            | 10,69                        |
| Messina .....     | maass .....              | 113 $\frac{3}{4}$               | 203,08                       |
| Minorca .....     | salma wine measure....   | 5270                            | 4,38                         |
| Montpellier ..... | caffise oil measure....  | 527                             | 43,83                        |
| Naples .....      | quartillo .....          | 349 $\frac{1}{2}$               | 66,09                        |
| Narva .....       | pot wine measure .....   | 64 $\frac{1}{8}$                | 360,23                       |
| Nice .....        | pot oil measure .....    | 71 $\frac{3}{8}$                | 323,64                       |
| North .....       | stara oil measure....    | 3407                            | 6,78                         |
| Nuremberg .....   | barile wine measure ...  | 2541                            | 9,09                         |
| Oneglia .....     | stof .....               | 78 $\frac{3}{5}$                | 293,90                       |
| Oporto .....      | rubbo oil measure....    | 515                             | 44,85                        |
| Osnaburg .....    | barrel pitch measure.... | 7067                            | 3,27                         |
| Oviedo .....      | maas tavern measure....  | 60 $\frac{1}{2}$                | 381,81                       |
| Paris .....       | barile oil measure ..... | 3783                            | 6,11                         |
| Pernau .....      | aliquer .....            | 675 $\frac{3}{4}$               | 34,18                        |
| Pola .....        | canhada .....            | 112 $\frac{5}{8}$               | 205,10                       |
| Prague .....      | kanne .....              | 74 $\frac{3}{8}$                | 310,58                       |
| Puglia .....      | quartillo .....          | 34 $\frac{1}{2}$                | 669,56                       |
| Ratisbon .....    | setier .....             | 464 $\frac{4}{5}$               | 49,70                        |
| Revel .....       | pinte .....              | 58 $\frac{1}{10}$               | 397,62                       |
| Riga .....        | litre new measure .....  | 61                              | 378,69                       |
| Rochelle .....    | stof .....               | 78 $\frac{3}{5}$                | 293,90                       |
| Rome .....        | salma .....              | 9196                            | 2,51                         |
| Rotterdam .....   | pint .....               | 116                             | 199,14                       |
| Russia .....      | staja .....              | 940                             | 24,57                        |
| Saragossa .....   | viertel .....            | 216 $\frac{1}{2}$               | 106,70                       |
| Schafhausen ..... | stof .....               | 72 $\frac{1}{2}$                | 318,62                       |
| Scotland .....    | stof .....               | 75                              | 308,                         |
| Sicily .....      | velt .....               | 447 $\frac{1}{2}$               | 51,62                        |
| Spain .....       | boccale .....            | 79 $\frac{4}{5}$                | 289,47                       |
|                   | stoopen .....            | 156                             | 143,08                       |
|                   | wedra .....              | 751                             | 30,76                        |
|                   | kruska .....             | 93 $\frac{1}{8}$                | 246,07                       |
|                   | cantara .....            | 584                             | 39,55                        |
|                   | maas .....               | 79 $\frac{4}{5}$                | 289,47                       |
|                   | pint old measure .....   | 103 $\frac{2}{5}$               | 223,40                       |
|                   | caffise .....            | 695                             | 33,24                        |
|                   | moyo wine measure....    | 15152                           | 1,52                         |
|                   | cantara ditto .....      | 947                             | 24,39                        |
|                   | azumbre ditto .....      | 118 $\frac{3}{8}$               | 195,14                       |
|                   | quartillo ditto .....    | 29 $\frac{1}{5}$                | 780,40                       |
|                   | arroba oil measure....   | 740                             | 31,22                        |



## LIQUID MEASURE.

| Places.                      | Measures.                 | Contents<br>of each<br>measure. | Equiv. to<br>100.<br>gallons. |
|------------------------------|---------------------------|---------------------------------|-------------------------------|
|                              |                           | Cubic in.                       | Num. 100.                     |
| Spain ( <i>continued</i> ).. | quartilla measure .....   | 185                             | 124,86                        |
|                              | libra ditto .....         | $29\frac{3}{5}$                 | 780,40                        |
| Strettin .....               | næssel .....              | $44\frac{1}{4}$                 | 516,20                        |
| Stralsund .....              | stubgen .....             | 237                             | 97,47                         |
| Strasburg .....              | schoppen .....            | $29\frac{3}{5}$                 | 780,40                        |
| Sweden .....                 | kanna .....               | $159\frac{5}{8}$                | 144,71                        |
| Toulon .....                 | millerolle .....          | 3927                            | 5,88                          |
| Trieste .....                | orna oil measure .....    | 4003                            | 5,77                          |
|                              | barile wine measure ..... | 4158                            | 5,56                          |
| Tripoli .....                | mataro .....              | 1375                            | 16,80                         |
| Tunis .....                  | mataro oil measure .....  | 1155                            | 20,                           |
|                              | mataro wine measure ..    | $577\frac{1}{2}$                | 40,                           |
| Turin .....                  | pint .....                | $95\frac{1}{2}$                 | 241,89                        |
| Valencia .....               | cantara .....             | $775\frac{5}{8}$                | 29,78                         |
| Venice .....                 | miro oil measure .....    | 962                             | 24,                           |
|                              | secchia wine measure ..   | $602\frac{1}{4}$                | 38,36                         |
| Verona .....                 | basso .....               | $275\frac{3}{4}$                | 83,77                         |
| Vienna .....                 | eimer .....               | 3614                            | 6,39                          |
|                              | maas .....                | $90\frac{1}{3}$                 | 255,72                        |
| Zell .....                   | stubgen .....             | 237                             | 97,47                         |
| Zurich .....                 | maas .....                | $111\frac{1}{4}$                | 207,64                        |

The following Examples will shew in what manner the proportion between the liquid measures of any two given countries may be ascertained.

*Examples.*

Let it be required to reduce 100 litres new French measure into Spanish quartillos wine measure.

The French litre measuring internally 61 English cubic inches, and the Spanish quartillo  $29\frac{3}{5}$ , according to the table prefixed, I state the following equation:

$$\begin{aligned}
 100 \text{ litres} &= x \\
 1 \text{ litre} &= 61 \text{ cubic inches} \\
 29\frac{3}{5} \text{ cubic inches} &= 1 \text{ quartillo} \\
 \text{Result } 206,08 \text{ quartillos.}
 \end{aligned}$$

Reduce 100 quartillos wine measure of Spain into litres new measure of France.

$$\begin{aligned}
 100 \text{ quartillos} &= x \\
 1 \text{ quartillo} &= 29\frac{3}{5} \text{ cubic inches} \\
 61 \text{ cubic inches} &= 1 \text{ litre} \\
 \text{Result } 48,52 \text{ litres.}
 \end{aligned}$$



## TABLE VIII.

*The Length in English Lines of each of the Measures used in the Sale of Cloths, Linens, and Silk Stuffs, and the Relation of Foreign Measures to 100 Yards and 100 Ells English Measure.*

## CLOTH MEASURE.

| Places.            | Measures.                | Length of<br>each<br>measure. | Equiv.<br>to 100<br>yards. | Equiv.<br>to 100<br>ells. |
|--------------------|--------------------------|-------------------------------|----------------------------|---------------------------|
|                    |                          | Lines 100.                    | Num. 100.                  | Num. 100.                 |
| Abbeville.....     | aune .....               | 558,25                        | 77,38                      | 96,73                     |
| Aix la Chapelle... | elle .....               | 315,35                        | 137,                       | 171,25                    |
| Aleppo.....        | pike .....               | 319,40                        | 135,25                     | 169,06                    |
| Alexandria .....   | pike .....               | 319,60                        | 135,17                     | 168,96                    |
| Algiers.....       | pike long measure .....  | 294,05                        | 146,91                     | 183,64                    |
|                    | pike short measure ..... | 220 53                        | 195,89                     | 244,86                    |
| Alicante .....     | vara .....               | 399,20                        | 108,22                     | 135,27                    |
| Altona .....       | elle .....               | 270,60                        | 159,64                     | 199,50                    |
|                    | elle Brabant measure ..  | 326,54                        | 132,30                     | 165,37                    |
| Amberg .....       | elle .....               | 394,40                        | 109,53                     | 136,91                    |
| Amsterdam .....    | elle .....               | 326,                          | 132,51                     | 165,64                    |
| Ancona .....       | braccio .....            | 303,40                        | 142,38                     | 177,98                    |
| Anspach .....      | elle .....               | 289,80                        | 149,07                     | 186,34                    |
| Antwerp .....      | aune long measure .....  | 327,90                        | 131,75                     | 164,69                    |
|                    | aune short measure.....  | 323,25                        | 133,64                     | 167,05                    |
| Archangel .....    | archine .....            | 336,                          | 128,57                     | 160,71                    |
| Arragon .....      | vara .....               | 364,13                        | 118,64                     | 148,30                    |
| Arras .....        | aune .....               | 329,65                        | 131,05                     | 163,81                    |
| Augsburg.....      | elle long measure .....  | 287,85                        | 150,08                     | 187,60                    |
|                    | elle short measure ..... | 279,75                        | 154,42                     | 193,02                    |
| Avignon .....      | canne .....              | 918,80                        | 47,02                      | 58,77                     |
|                    | aune .....               | 551,20                        | 78,37                      | 97,96                     |
| Basil.....         | aune .....               | 556,80                        | 77,58                      | 96,98                     |
| Bamberg .....      | elle .....               | 344,65                        | 125,35                     | 156,69                    |
| Barcelona .....    | cana .....               | 727,45                        | 59,39                      | 74,23                     |
| Bayreuth .....     | elle .....               | 283,60                        | 152,33                     | 190,41                    |
| Batavia .....      | covid .....              | 237,60                        | 181,82                     | 227,27                    |
| Bautzen .....      | elle .....               | 272,                          | 158,82                     | 198,53                    |
| Bayonne .....      | aune .....               | 417,40                        | 103,50                     | 129,38                    |
| Bengal .....       | covid .....              | 108,                          | 400,                       | 500,                      |
| Bergamo .....      | braccio .....            | 309,50                        | 139,58                     | 174,47                    |
| Bergen .....       | elle .....               | 296,45                        | 145,72                     | 182,15                    |
| Berg-op-Zoom ....  | elle .....               | 327,07                        | 132,08                     | 165,10                    |
| Berlin .....       | elle .....               | 314,90                        | 137,19                     | 171,48                    |
| Bern .....         | elle .....               | 255,80                        | 168,89                     | 211,10                    |
| Bielefeld .....    | elle .....               | 276,25                        | 156,38                     | 195,47                    |



## CLOTH MEASURE.

| Places.            | Measures.                  | Length of<br>each<br>measure.<br>—<br>Lines 100. | Equiv.<br>to 100<br>yards.<br>—<br>Num. 100. | Equiv.<br>to 100<br>ells.<br>—<br>Num. 100. |
|--------------------|----------------------------|--------------------------------------------------|----------------------------------------------|---------------------------------------------|
| Bilboa .....       | vara .....                 | 395,25                                           | 109,30                                       | 136,62                                      |
| Bologna .....      | braccio for silk stuffs .. | 281,25                                           | 153,60                                       | 192,                                        |
|                    | braccio for cloths .....   | 299,90                                           | 144,05                                       | 180,06                                      |
| Bolzano .....      | elle .....                 | 373,20                                           | 115,75                                       | 144,69                                      |
|                    | braccio .....              | 259,60                                           | 166,40                                       | 208,                                        |
| Bombay .....       | cuz .....                  | 336,                                             | 128,57                                       | 160,71                                      |
|                    | heat .....                 | 216,                                             | 200,                                         | 250,                                        |
| Bordeaux .....     | aune .....                 | 562,51                                           | 76,80                                        | 96,                                         |
| Brabant .....      | aune .....                 | 326,54                                           | 132,30                                       | 165,37                                      |
| Breda .....        | elle .....                 | 327,07                                           | 132,08                                       | 165,10                                      |
| Bremen .....       | elle .....                 | 273,15                                           | 158,15                                       | 197,69                                      |
| Brescia .....      | braccio .....              | 221,06                                           | 195,42                                       | 244,28                                      |
| Breslau .....      | elle .....                 | 259,65                                           | 166,38                                       | 207,97                                      |
|                    | elle Silesia measure ..... | 272,                                             | 158,82                                       | 198,53                                      |
| Bretagne .....     | aune .....                 | 636,25                                           | 67,90                                        | 84,87                                       |
| Bruges .....       | aune .....                 | 327,90                                           | 131,75                                       | 164,69                                      |
|                    | aune for linens .....      | 342,40                                           | 126,17                                       | 157,71                                      |
| Brunswick .....    | elle .....                 | 269,55                                           | 160,27                                       | 200,33                                      |
| Brussels .....     | aune long measure .....    | 327,90                                           | 131,75                                       | 164,69                                      |
|                    | aune short measure .....   | 323,25                                           | 133,64                                       | 167,05                                      |
| Burgos .....       | vara .....                 | 395,25                                           | 109,30                                       | 136,62                                      |
| Cadiz .....        | vara .....                 | 395,25                                           | 109,30                                       | 136,62                                      |
|                    | ana Brabant measure .....  | 327,90                                           | 131,75                                       | 164,69                                      |
| Caën .....         | aune .....                 | 558,25                                           | 77,38                                        | 96,73                                       |
| Cagliari .....     | raso .....                 | 259,20                                           | 166,66                                       | 208,33                                      |
| Cairo .....        | pike .....                 | 319,60                                           | 135,17                                       | 168,96                                      |
| Calais .....       | aune .....                 | 558,25                                           | 77,38                                        | 96,73                                       |
| Calicut .....      | covid .....                | 216,                                             | 200,                                         | 250,                                        |
|                    | guz .....                  | 338,40                                           | 127,66                                       | 159,57                                      |
| Cambrai .....      | aune .....                 | 338,35                                           | 127,68                                       | 159,60                                      |
| Canary Islands ... | vara .....                 | 406,20                                           | 106,35                                       | 132,94                                      |
| Candia .....       | pike .....                 | 301,                                             | 143,52                                       | 179,40                                      |
| Canton .....       | covid .....                | 175,50                                           | 246,15                                       | 307,70                                      |
| Carthage .....     | vara .....                 | 395,25                                           | 109,30                                       | 136,62                                      |
| Cassel .....       | elle .....                 | 265,                                             | 163,                                         | 203,75                                      |
| Castille .....     | vara .....                 | 395,25                                           | 109,30                                       | 136,62                                      |
| Chambery .....     | raso .....                 | 271,35                                           | 159,20                                       | 199,                                        |
| China .....        | covid .....                | 175,50                                           | 246,15                                       | 307,70                                      |
| Christiana .....   | elle .....                 | 296,45                                           | 145,72                                       | 182,15                                      |
| Coblentz .....     | elle .....                 | 263,55                                           | 163,91                                       | 204,89                                      |
| Coburg .....       | elle .....                 | 276,90                                           | 156,                                         | 195,                                        |
| Cologne .....      | elle long measure .....    | 328,15                                           | 131,65                                       | 164,56                                      |
|                    | elle short measure .....   | 271,15                                           | 159,32                                       | 199,15                                      |
| Constance .....    | elle long measure .....    | 351,05                                           | 123,06                                       | 153,82                                      |
|                    | elle short measure .....   | 326,33                                           | 132,38                                       | 165,48                                      |



## CLOTH MEASURE.

| Places.                             | Measures.                         | Length of<br>each<br>measure. | Equiv.<br>to 100<br>yards. | Equiv.<br>to 100<br>ells. |
|-------------------------------------|-----------------------------------|-------------------------------|----------------------------|---------------------------|
|                                     |                                   | Lines 100.                    | Num. 100.                  | Num. 100.                 |
| Constantinople . . .                | pike long measure . . . . .       | 316,                          | 156,70                     | 170,88                    |
|                                     | pike short measure . . . . .      | 306,                          | 141,18                     | 176,47                    |
| Copenhagen . . . . .                | alen . . . . .                    | 296,45                        | 145,72                     | 182,15                    |
| Corfu . . . . .                     | pike . . . . .                    | 271,                          | 159,41                     | 199,26                    |
| Corsica . . . . .                   | palmo . . . . .                   | 118,15                        | 365,64                     | 457,05                    |
| Cracow . . . . .                    | elle . . . . .                    | 291,40                        | 148,25                     | 185,32                    |
| Cremona . . . . .                   | braccio . . . . .                 | 290,50                        | 148,70                     | 185,93                    |
| Cyprus . . . . .                    | pike . . . . .                    | 317,15                        | 136,21                     | 170,26                    |
| Damascus . . . . .                  | pike . . . . .                    | 274,85                        | 157,17                     | 196,47                    |
| Dantzic . . . . .                   | elle . . . . .                    | 271,                          | 159,41                     | 199,26                    |
| Delft . . . . .                     | elle . . . . .                    | 326,                          | 132,51                     | 165,64                    |
| Denmark . . . . .                   | alen . . . . .                    | 296,45                        | 145,72                     | 182,15                    |
| Dresden . . . . .                   | elle . . . . .                    | 267,30                        | 161,61                     | 202,02                    |
| Dublin . . . . .                    | yard . . . . .                    | 432,                          | 100,                       | 125,                      |
|                                     | ell . . . . .                     | 540,                          | 80,                        | 100,                      |
| Dunkirk . . . . .                   | aune . . . . .                    | 319,40                        | 135,25                     | 169,06                    |
| Dusseldorf . . . . .                | elle . . . . .                    | 254,80                        | 169,54                     | 211,93                    |
| Elbing . . . . .                    | elle . . . . .                    | 266,88                        | 161,87                     | 202,34                    |
| Embsen . . . . .                    | elle . . . . .                    | 316,60                        | 136,45                     | 170,56                    |
| England . . . . .                   | yard . . . . .                    | 432,                          | 100,                       | 125,                      |
|                                     | ell . . . . .                     | 540,                          | 80,                        | 100,                      |
| Erfurt . . . . .                    | elle long measure . . . . .       | 259,60                        | 166,40                     | 208,                      |
|                                     | elle short measure . . . . .      | 190,70                        | 226,53                     | 283,17                    |
| Erlang . . . . .                    | elle . . . . .                    | 311,50                        | 138,62                     | 173,35                    |
| Fermo . . . . .                     | braccio . . . . .                 | 310,                          | 139,35                     | 174,20                    |
| Ferrara . . . . .                   | braccio for cloths . . . . .      | 316,                          | 136,70                     | 170,88                    |
|                                     | braccio for silk stuffs . . . . . | 297,                          | 145,45                     | 181,82                    |
| Flensburg . . . . .                 | elle . . . . .                    | 270,60                        | 159,64                     | 199,50                    |
| Florence . . . . .                  | braccio for cloths . . . . .      | 278,90                        | 154,90                     | 193,62                    |
|                                     | braccio for silk stuffs . . . . . | 274,85                        | 157,17                     | 196,47                    |
| Forli . . . . .                     | braccio . . . . .                 | 290,50                        | 148,70                     | 185,93                    |
| France . . . . .                    | aune of 528 lines . . . . .       | 562,51                        | 76,80                      | 96,                       |
|                                     | metre . . . . .                   | 472,27                        | 91,47                      | 114,34                    |
| Frankfort on the<br>Maine . . . . . | elle . . . . .                    | 254,80                        | 169,54                     | 211,93                    |
|                                     | elle Brabant measure . . . . .    | 326,54                        | 132,30                     | 165,37                    |
|                                     | aune of Paris . . . . .           | 561,27                        | 76,97                      | 96,21                     |
| Frankfort on the<br>Oder . . . . .  | elle . . . . .                    | 313,83                        | 137,87                     | 172,34                    |
| Freyberg . . . . .                  | elle . . . . .                    | 267,60                        | 161,43                     | 201,79                    |
| Gand . . . . .                      | aune . . . . .                    | 327,90                        | 131,75                     | 164,69                    |
|                                     | aune for lineus . . . . .         | 342,40                        | 126,17                     | 157,71                    |
| Geneva . . . . .                    | aune . . . . .                    | 540,13                        | 79,98                      | 99,97                     |
|                                     | aune of France . . . . .          | 562,51                        | 76,80                      | 96,                       |
| Genoa . . . . .                     | canna of 10½ palmi . . . . .      | 1245,10                       | 34,70                      | 43,37                     |
|                                     | canna of 10 palmi . . . . .       | 1185,80                       | 36,43                      | 45,54                     |



## CLOTH MEASURE.

| Places.                  | Measures.                 | Length of<br>each<br>measure. | Equiv.<br>to 100<br>yards. | Equiv.<br>to 100,<br>ells. |
|--------------------------|---------------------------|-------------------------------|----------------------------|----------------------------|
|                          |                           | Lines 100.                    | Num. 100.                  | Num. 100.                  |
| <b>Genoa (continued)</b> | canna of 9 palmi .....    | 1067,20                       | 40,48                      | 50,60                      |
|                          | braccio .....             | 276,70                        | 156,13                     | 195,16                     |
|                          | palmi .....               | 118,58                        | 364,32                     | 455,40                     |
| <b>Gibraltar</b> .....   | vara .....                | 395,25                        | 109,30                     | 136,62                     |
| <b>Glatz</b> .....       | elle .....                | 276,80                        | 156,07                     | 195,08                     |
| <b>Gombroon</b> .....    | gueze .....               | 464,52                        | 93,                        | 116,25                     |
| <b>Gorlitz</b> .....     | elle .....                | 266,25                        | 169,90                     | 212,37                     |
| <b>Gottenburg</b> .....  | alle .....                | 280,40                        | 154,06                     | 192,58                     |
| <b>Gottingen</b> .....   | elle .....                | 274,85                        | 157,17                     | 196,47                     |
| <b>Guastalla</b> .....   | braccio .....             | 321,85                        | 134,22                     | 167,78                     |
| <b>Gueldres</b> .....    | elle .....                | 313,22                        | 137,92                     | 172,40                     |
| <b>Guinea</b> .....      | jactam .....              | 1728,                         | 25,                        | 31,25                      |
| <b>Halle</b> .....       | elle long measure .....   | 34,90                         | 137,19                     | 171,48                     |
|                          | elle short measure .....  | 269,75                        | 160,15                     | 200,18                     |
| <b>Hamburg</b> .....     | elle .....                | 270,60                        | 159,64                     | 199,50                     |
|                          | elle Brabant measure ..   | 326,54                        | 132,30                     | 165,37                     |
| <b>Hanover</b> .....     | elle .....                | 274,85                        | 157,17                     | 196,47                     |
| <b>Harburg</b> .....     | elle .....                | 274,85                        | 157,17                     | 196,47                     |
| <b>Haarlem</b> .....     | elle .....                | 343,70                        | 125,69                     | 157,11                     |
| <b>Havre de Grace</b> .. | aune .....                | 558,25                        | 77,38                      | 96,73                      |
| <b>Hague</b> .....       | elle .....                | 326,                          | 132,51                     | 165,64                     |
| <b>Heidelberg</b> .....  | elle .....                | 394,25                        | 109,57                     | 136,97                     |
| <b>Hildesheim</b> .....  | elle .....                | 264,53                        | 163,30                     | 204,13                     |
| <b>Hirchsberg</b> .....  | elle .....                | 272,                          | 158,82                     | 198,53                     |
| <b>Hoff</b> .....        | elle .....                | 301,                          | 143,52                     | 179,40                     |
| <b>Jagerndorf</b> .....  | elle .....                | 268,50                        | 160,90                     | 201,12                     |
| <b>Japan</b> .....       | inck .....                | 897,60                        | 48,13                      | 60,16                      |
| <b>Java</b> .....        | covid .....               | 237,60                        | 181,82                     | 227,27                     |
| <b>Jerusalem</b> .....   | pike .....                | 324,                          | 133,33                     | 166,67                     |
| <b>Ingolstadt</b> .....  | elle .....                | 376,07                        | 114,87                     | 143,59                     |
| <b>Inspruck</b> .....    | elle .....                | 371,30                        | 116,35                     | 145,23                     |
| <b>Kiel</b> .....        | elle .....                | 271,70                        | 159,                       | 198,75                     |
| <b>Kintzingen</b> .....  | elle .....                | 281,60                        | 153,41                     | 191,76                     |
| <b>Konigsberg</b> .....  | elle .....                | 314,90                        | 137,19                     | 171,48                     |
| <b>Krems</b> .....       | elle .....                | 353,25                        | 122,29                     | 152,87                     |
| <b>Lauban</b> .....      | elle .....                | 266,25                        | 169,90                     | 212,37                     |
| <b>Leghorn</b> .....     | canna for cloths, .....   | 1115,60                       | 38,72                      | 48,40                      |
|                          | braccio .....             | 278,90                        | 154,90                     | 193,62                     |
|                          | palmi .....               | 139,40                        | 309,80                     | 387,24                     |
|                          | canna for silk stuffs, .. | 1099,40                       | 39,29                      | 49,12                      |
|                          | braccio .....             | 274,85                        | 157,17                     | 196,47                     |
|                          | palmi .....               | 137,42                        | 314,34                     | 392,94                     |
| <b>Leipsic</b> .....     | elle .....                | 267,                          | 161,80                     | 202,25                     |
| <b>Leutkirch</b> .....   | elle .....                | 331,87                        | 130,17                     | 162,72                     |
| <b>Leyden</b> .....      | elle .....                | 322,60                        | 133,91                     | 167,39                     |



## CLOTH MEASURE.

| Places.          | Measures.                  | Length of<br>each<br>measure. | Equiv.<br>to 100<br>yards. | Equiv.<br>to 100<br>ells. |
|------------------|----------------------------|-------------------------------|----------------------------|---------------------------|
|                  |                            | Lines 100.                    | Num. 100                   | Num. 100                  |
| Liebau .....     | elle .....                 | 267,                          | 161,80                     | 202,25                    |
| Liege .....      | elle .....                 | 260,50                        | 165,84                     | 207,30                    |
| Lisbon .....     | vara .....                 | 517,80                        | 83,43                      | 104,29                    |
|                  | covado .....               | 319,85                        | 135,06                     | 168,83                    |
|                  | palmo craveiro .....       | 106,62                        | 405,17                     | 506,47                    |
|                  | palmo menor .....          | 103,56                        | 417,15                     | 521,44                    |
|                  | aune .....                 | 332,40                        | 129,96                     | 162,45                    |
| Lisle .....      | aune .....                 | 332,40                        | 129,96                     | 162,45                    |
| London .....     | yard .....                 | 432,                          | 100,                       | 125,                      |
|                  | ell. ....                  | 540,                          | 80,                        | 100,                      |
| Louvaine .....   | aune long measure .....    | 327,90                        | 131,75                     | 164,69                    |
|                  | aune short measure .....   | 323,25                        | 133,64                     | 167,05                    |
| Lubec .....      | elle .....                 | 272,50                        | 158,52                     | 198,16                    |
| Lucca .....      | braccio for cloths ....    | 285,84                        | 151,13                     | 188,92                    |
|                  | braccio for silk stuffs .. | 273,25                        | 158,10                     | 197,62                    |
| Lunenburg .....  | elle .....                 | 274,85                        | 157,17                     | 196,47                    |
| Lyons .....      | aune .....                 | 552,70                        | 78,16                      | 97,70                     |
| Madeira .....    | vara .....                 | 517,80                        | 83,43                      | 104,29                    |
| Madras .....     | covid .....                | 216,                          | 200,                       | 250,                      |
| Madrid .....     | vara .....                 | 395,25                        | 109,30                     | 136,62                    |
| Magdeburg ....   | elle .....                 | 314,90                        | 137,19                     | 171,48                    |
| Mahon .....      | cana .....                 | 756,                          | 57,14                      | 71,43                     |
| Majorca .....    | cana .....                 | 810,                          | 53,33                      | 66,66                     |
| Malaga .....     | vara .....                 | 395,25                        | 109,30                     | 136,62                    |
| Malines .....    | aune .....                 | 323,25                        | 133,64                     | 167,05                    |
| Malta .....      | canna .....                | 1058,40                       | 40,82                      | 51,02                     |
| Manheim .....    | elle .....                 | 263,45                        | 163,98                     | 204,97                    |
| Mantua .....     | braccio .....              | 219,70                        | 196,63                     | 245,79                    |
| Marseilles ..... | canne .....                | 948,20                        | 45,56                      | 56,95                     |
|                  | aune .....                 | 552,60                        | 78,18                      | 97,72                     |
| Mastrick .....   | elle .....                 | 322,80                        | 133,83                     | 167,28                    |
| Mecca .....      | covid .....                | 324,                          | 133,33                     | 166,66                    |
| Memel .....      | elle .....                 | 271,                          | 159,41                     | 199,26                    |
| Memmingen ....   | elle .....                 | 331,33                        | 130,38                     | 162,98                    |
| Mentz .....      | elle .....                 | 259,20                        | 166,66                     | 208,33                    |
| Messina .....    | canna .....                | 918,72                        | 47,02                      | 58,77                     |
|                  | palmo .....                | 114,84                        | 376,18                     | 470,22                    |
| Middelburg ....  | elle .....                 | 326,                          | 132,51                     | 165,64                    |
| Milan .....      | braccio for cloths .....   | 319,40                        | 135,25                     | 169,06                    |
|                  | braccio for silk stuffs .. | 253,34                        | 170,52                     | 213,15                    |
| Minden .....     | elle .....                 | 273,40                        | 158,                       | 197,50                    |
| Minorca .....    | cana .....                 | 756,                          | 57,14                      | 71,43                     |
| Mocha .....      | guz .....                  | 300,                          | 144,                       | 180,                      |
|                  | covid .....                | 216,                          | 200,                       | 250,                      |
| Modena .....     | braccio .....              | 302,35                        | 142,88                     | 178,60                    |
| Montpellier .... | canne .....                | 946,                          | 45,66                      | 57,08                     |



## CLOTH MEASURE.

| Places.          | Measures.                             | Length of        | Equiv.           | Equiv.          |
|------------------|---------------------------------------|------------------|------------------|-----------------|
|                  |                                       | each<br>measure. | to 100<br>yards. | to 100<br>ells. |
|                  |                                       | Lines 100        | Num. 100.        | Num. 100        |
| Morea .....      | pike .....                            | 216,             | 200,             | 250,            |
| Morlaix .....    | aune .....                            | 636,25           | 67,90            | 84,87           |
| Morocco .....    | covado .....                          | 238,10           | 181,44           | 226,80          |
| Munich .....     | elle .....                            | 394,30           | 109,56           | 136,95          |
| Munster .....    | elle .....                            | 381,80           | 113,15           | 141,43          |
| Munden .....     | elle .....                            | 276,15           | 156,44           | 195,55          |
| Namur .....      | elle .....                            | 313,22           | 137,92           | 172,40          |
| Nantes .....     | aune of Bretagne .....                | 636,25           | 67,90            | 84,87           |
| Naples .....     | canna .....                           | 996,32           | 43,36            | 54,20           |
|                  | palmo .....                           | 124,54           | 346,88           | 433,60          |
| Narva .....      | elle .....                            | 279,66           | 154,47           | 193,09          |
|                  | archine .....                         | 33,              | 128,57           | 160,71          |
| Naumburg .....   | elle .....                            | 267,             | 161,80           | 202,25          |
| Negropont .....  | pike .....                            | 291,             | 148,45           | 185,57          |
| Neufchatel ..... | elle .....                            | 525,45           | 82,22            | 102,77          |
| Nice .....       | raso .....                            | 259,20           | 166,66           | 208,33          |
|                  | palmo .....                           | 124,65           | 346,57           | 433,21          |
| Nienburg .....   | elle .....                            | 274,85           | 157,17           | 196,47          |
| Nimeguen .....   | elle .....                            | 313,22           | 137,92           | 172,40          |
| Nordlingen ..... | elle .....                            | 288,40           | 149,80           | 187,24          |
| Norway .....     | elle .....                            | 296,45           | 145,72           | 182,15          |
| Nuremberg .....  | elle .....                            | 311,50           | 138,68           | 173,35          |
| Oporto .....     | vara .....                            | 517,80           | 83,43            | 104,29          |
|                  | covado .....                          | 313,62           | 137,75           | 172,18          |
|                  | palmo craveiro .....                  | 104,54           | 413,25           | 516,54          |
|                  | palmo menor .....                     | 103,56           | 417,50           | 521,44          |
| Oran .....       | vara .....                            | 395,25           | 109,30           | 136,62          |
|                  | pike for cloths. ....                 | 324,             | 133,33           | 166,66          |
| Osnabruck .....  | elle .....                            | 275,50           | 156,80           | 196,            |
|                  | elle for linens .....                 | 284,20           | 152,             | 190,            |
| Ostend .....     | aune .....                            | 330,20           | 130,81           | 163,51          |
| Osterode .....   | elle .....                            | 274,85           | 157,17           | 196,47          |
| Oudenard .....   | elle .....                            | 315,35           | 137,             | 171,25          |
| Oviedo .....     | vara .....                            | 407,50           | 106,02           | 132,52          |
| Paderborn .....  | elle .....                            | 254,80           | 169,54           | 211,93          |
| Padua .....      | braccio .....                         | 316,75           | 136,38           | 170,48          |
| Palermo .....    | canna .....                           | 918,72           | 47,02            | 58,77           |
|                  | palmo .....                           | 114,84           | 376,18           | 470,22          |
| Paris .....      | aune of 528 lines .....               | 562,51           | 76,80            | 96,             |
|                  | aune of 526 $\frac{5}{8}$ lines ..... | 561,27           | 76,97            | 96,21           |
|                  | aune of 524 lines .....               | 558,25           | 77,38            | 96,73           |
|                  | metre .....                           | 472,27           | 91,47            | 114,34          |
| Parma .....      | braccio .....                         | 258,15           | 167,35           | 209,19          |
| Patras .....     | pike for cloths and linens            | 324,             | 133,33           | 166,66          |
|                  | pike for silk stuffs .....            | 300,             | 44,              | 80,             |
| Pekin .....      | peking .....                          | 168,33           | 256,64           | 320,80          |



## CLOTH MEASURE.

| Places.          | Measures.                                 | Length of<br>each<br>measure. | Equiv.<br>to 100<br>yards. | Equiv.<br>to 100<br>ells. |
|------------------|-------------------------------------------|-------------------------------|----------------------------|---------------------------|
|                  |                                           | Lines 100.                    | Num. 100.                  | Num. 100.                 |
| Pernau .....     | elle .....                                | 259,10                        | 166,73                     | 208,41                    |
| Persia .....     | gneze .....                               | 297,50                        | 145,21                     | 181,52                    |
|                  | gneze monkelse .....                      | 446,40                        | 96,77                      | 120,97                    |
| Perugia .....    | braccio .....                             | 305,34                        | 141,48                     | 176,85                    |
| Piedmont .....   | raso .....                                | 281,25                        | 153,60                     | 192,                      |
| Pisa .....       | palmo .....                               | 140,95                        | 306,50                     | 383,12                    |
| Placentia .....  | braccio .....                             | 306,30                        | 141,04                     | 176,30                    |
| Poland .....     | elle .....                                | 291,40                        | 148,25                     | 185,32                    |
| Pondicherr ..    | covid .....                               | 216,                          | 200,                       | 250,                      |
| Pontremoli ..... | braccio .....                             | 326,10                        | 132,47                     | 165,59                    |
| Posen .....      | elle .....                                | 269,                          | 160,59                     | 200,74                    |
| Prague .....     | elle .....                                | 279,                          | 154,84                     | 193,55                    |
| Presburg .....   | elle .....                                | 263,60                        | 163,89                     | 204,86                    |
| Queda .....      | covid .....                               | 216,                          | 200,                       | 250,                      |
| Ragusa .....     | ana .....                                 | 242,40                        | 178,22                     | 222,78                    |
| Ratisbon .....   | elle .....                                | 383,                          | 112,80                     | 141,                      |
| Ratzeburg .....  | elle .....                                | 274,85                        | 157,17                     | 196,47                    |
| Ravenna .....    | braccio .....                             | 317,50                        | 136,06                     | 170,08                    |
| Ravensburg ...   | elle .....                                | 324,60                        | 138,08                     | 166,36                    |
| Reccanati .....  | braccio .....                             | 314,20                        | 137,50                     | 171,87                    |
| Reggio .....     | braccio .....                             | 250,20                        | 172,66                     | 215,82                    |
| Revel .....      | elle .....                                | 352,80                        | 170,88                     | 213,60                    |
| Rhodes .....     | pike .....                                | 357,                          | 121,                       | 151,25                    |
| Riga .....       | elle .....                                | 258,90                        | 166,86                     | 208,57                    |
| Rimini .....     | braccio .....                             | 302,85                        | 142,88                     | 178,60                    |
| Rochelle .....   | aune .....                                | 558,25                        | 77,38                      | 96,73                     |
| Rome .....       | canna for linens .....                    | 987,                          | 43,77                      | 54,71                     |
|                  | braccio ditto .....                       | 299,80                        | 144,10                     | 180,12                    |
|                  | canna for cloths and silk<br>stuffs ..... | 939,66                        | 45,97                      | 57,47                     |
|                  | braccio ditto .....                       | 400,50                        | 107,86                     | 134,83                    |
| Rostock .....    | elle .....                                | 273,15                        | 158,15                     | 197,69                    |
| Rotenburg .....  | elle .....                                | 276,90                        | 156,                       | 195,                      |
| Rotterdam .....  | elle .....                                | 326,                          | 132,51                     | 165,64                    |
| Rouen .....      | aune for cloths .....                     | 549,75                        | 78,58                      | 98,23                     |
|                  | aune for linens .....                     | 659,68                        | 65,49                      | 81,86                     |
| Roveredo .....   | braccio for cloths .....                  | 299,90                        | 144,05                     | 180,06                    |
|                  | braccio for silk stuffs ..                | 351,80                        | 122,80                     | 153,50                    |
| Ruremonde ....   | elle .....                                | 324,                          | 133,33                     | 166,66                    |
| Russia .....     | archine .....                             | 336,                          | 128,57                     | 160 71                    |
| Saltzburg .....  | elle for silk stuffs .....                | 379,15                        | 113,94                     | 142,42                    |
|                  | elle for cloths .....                     | 474,95                        | 90,96                      | 113,70                    |
| Sayd .....       | pike .....                                | 285,50                        | 151,31                     | 189,14                    |
| St. Gall .....   | elle for cloths .....                     | 291,                          | 148,45                     | 185,57                    |
|                  | elle for linens .....                     | 378,30                        | 114,20                     | 142,75                    |
| St. Malo .....   | aune .....                                | 636,25                        | 67,90                      | 84,87                     |



## CLOTH MEASURE.

| Places.                | Measures.                    | Length of        | Equiv. to     | Equiv. to    |
|------------------------|------------------------------|------------------|---------------|--------------|
|                        |                              | each<br>measure. | 100<br>yards. | 100<br>ells. |
|                        |                              | —                | —             | —            |
|                        |                              | Lines 100.       | Num. 100      | Num. 100.    |
| St. Petersburg . . .   | archine . . . . .            | 336,             | 128,57        | 160,71       |
| St. Sebastian . . . .  | vara . . . . .               | 395,25           | 109,30        | 136,62       |
| Saragossa . . . . .    | cana . . . . .               | 978,40           | 44,15         | 55,19        |
| Sardinia . . . . .     | raso . . . . .               | 259,20           | 166,66        | 208,33       |
|                        | palmo . . . . .              | 118,58           | 364,32        | 455,40       |
| Schafhausen . . . . .  | elle . . . . .               | 285,             | 151,58        | 189,47       |
| Schweinfurt . . . . .  | elle . . . . .               | 275,50           | 156,80        | 196,         |
| Scio . . . . .         | pike long measure . . .      | 324,             | 133,33        | 166,66       |
|                        | pike short measure . . .     | 311,80           | 138,55        | 173,19       |
| Scotland . . . . .     | ell old measure . . . . .    | 446,40           | 96,77         | 120,96       |
| Seville . . . . .      | vara . . . . .               | 395,25           | 109,30        | 136,62       |
| Siam . . . . .         | ken . . . . .                | 453,85           | 95,18         | 118,08       |
|                        | covid . . . . .              | 216,             | 200,          | 250,         |
| Sicily . . . . .       | canna . . . . .              | 918,72           | 47,02         | 58,77        |
|                        | palmo . . . . .              | 114,84           | 376,18        | 470,22       |
| Sienna . . . . .       | braccio for linens . . . .   | 283,50           | 152,38        | 190,48       |
|                        | braccio for cloths . . . .   | 178,35           | 242,22        | 302,78       |
| Silesia . . . . .      | elle . . . . .               | 272,             | 158,82        | 198,53       |
| Smyrna . . . . .       | pike . . . . .               | 324,             | 133,33        | 166,66       |
| Soleure . . . . .      | elle . . . . .               | 259,60           | 166,40        | 208,         |
| Spain . . . . .        | vara . . . . .               | 395,25           | 109,30        | 136,62       |
| Stade . . . . .        | elle . . . . .               | 274,85           | 157,17        | 196,47       |
| Stettin . . . . .      | elle . . . . .               | 307,36           | 140,55        | 175,69       |
| Stockholm . . . . .    | elle . . . . .               | 280,40           | 154,06        | 192,58       |
| Stralsund . . . . .    | elle . . . . .               | 274,85           | 157,17        | 196,47       |
| Strasburg . . . . .    | elle . . . . .               | 562,51           | 76,80         | 96,          |
|                        | brache . . . . .             | 254,60           | 169,68        | 212,10       |
| Surat . . . . .        | guz . . . . .                | 336,             | 128,57        | 160,71       |
|                        | cobit . . . . .              | 216,             | 200,          | 250,         |
| Sweden . . . . .       | elle . . . . .               | 280,40           | 154,06        | 192,58       |
| Teneriffe . . . . .    | vara . . . . .               | 395,25           | 109,30        | 136,62       |
| Thorn . . . . .        | elle . . . . .               | 269,             | 160,59        | 200,74       |
| Toledo . . . . .       | vara . . . . .               | 395,25           | 109,30        | 136,62       |
| Tortosa . . . . .      | cana . . . . .               | 751,75           | 57,46         | 71,83        |
| Toulon . . . . .       | canne . . . . .              | 915,80           | 47,17         | 58,96        |
| Toulouse . . . . .     | canne . . . . .              | 859,75           | 50,25         | 62,81        |
| Tournai . . . . .      | aune . . . . .               | 292,45           | 147,72        | 184,65       |
| Trente . . . . .       | elle for cloths . . . . .    | 319,60           | 135,17        | 168,96       |
|                        | elle for silk stuffs . . . . | 289,             | 149,48        | 186,85       |
| Treves . . . . .       | elle . . . . .               | 263,60           | 163,89        | 204,86       |
| Trevigo . . . . .      | braccio . . . . .            | 316,75           | 136,38        | 170,48       |
| Trieste . . . . .      | elle for cloths . . . . .    | 319,20           | 135,34        | 169,17       |
|                        | elle for silk stuffs . . . . | 302,55           | 142,78        | 178,48       |
| Tripoli in Barbary .   | pike . . . . .               | 260,90           | 165,58        | 206,98       |
| Tripoli in Syria . . . | pike . . . . .               | 324,             | 133,33        | 166,66       |
| Troppau . . . . .      | elle . . . . .               | 268,50           | 160,90        | 201,12       |



## CLOTH MEASURE.

| Places.            | Measures.                  | Length of        | Equiv.           | Equiv.          |
|--------------------|----------------------------|------------------|------------------|-----------------|
|                    |                            | each<br>measure. | to 100<br>yards. | to 100<br>ells. |
|                    |                            | Lines 100.       | Num. 100.        | Num. 100.       |
| Troyes .....       | aune .....                 | 374,70           | 115,29           | 144,12          |
| Tunis .....        | pike for cloths .....      | 317,80           | 135,93           | 169,92          |
|                    | pike for silk stuffs ..... | 297,93           | 145,             | 181,25          |
|                    | pike for linens .....      | 223,40           | 193,38           | 241,72          |
| Turkey .....       | pike long measure .....    | 316,             | 136,70           | 170,88          |
|                    | pike short measure .....   | 306,             | 141,18           | 176,47          |
| Turin .....        | raso .....                 | 284,90           | 151,63           | 189,54          |
| Ulm .....          | elle .....                 | 268,50           | 160,90           | 201,12          |
| Valencia .....     | vara .....                 | 428,20           | 100,88           | 126,10          |
| Valenciennes ..... | aune .....                 | 311,10           | 138,86           | 173,58          |
| Venice .....       | braccio for cloths .....   | 314,90           | 137,19           | 171,48          |
|                    | braccio for silk stuffs .. | 296,40           | 145,75           | 182,18          |
| Verden .....       | elle .....                 | 274,85           | 157,17           | 196,47          |
| Verona .....       | braccio .....              | 296,40           | 145,75           | 182,18          |
| Vicenza .....      | braccio .....              | 323,45           | 133,56           | 166,95          |
| Vienna .....       | elle .....                 | 367,             | 117,71           | 147,14          |
| Waldenburg .....   | elle .....                 | 272,             | 158,82           | 198,53          |
| Warendorf .....    | elle .....                 | 276,25           | 156,38           | 195,47          |
| Warsaw .....       | elle .....                 | 291,40           | 148,25           | 185,32          |
| Windesheim .....   | elle .....                 | 311,50           | 138,68           | 173,35          |
| Wirttemberg .....  | elle .....                 | 318,             | 135,85           | 169,81          |
| Wismar .....       | elle .....                 | 275,30           | 156,92           | 196,15          |
| Wurtzburg .....    | elle .....                 | 274,10           | 157,60           | 197,            |
| Xativa .....       | vara .....                 | 420,50           | 102,73           | 128,42          |
| Ypres .....        | aune .....                 | 330,25           | 130,81           | 163,51          |
| Zell .....         | elle .....                 | 274,85           | 157,17           | 196,47          |
| Zittau .....       | elle .....                 | 269,10           | 160,54           | 200,67          |
| Zurich .....       | elle .....                 | 283,40           | 152,43           | 190,54          |

The following Examples will shew in what manner the proportion between the measures of any two given countries may be ascertained.

*Examples.*

Let it be required to reduce 100 archines of Russia into varas of Spain.

The archine measuring 336 English lines, and the vara 395,25, according to the table prefixed, I state the following equation:

$$\begin{array}{rcl}
 & & 100 \text{ archines} = x \\
 1 \text{ archine} & = & 336 \text{ lines} \\
 395,25 \text{ lines} & = & 1 \text{ vara} \\
 & & \text{Result 85,01 varas.}
 \end{array}$$

Reduce 100 varas into archines.

$$\begin{array}{rcl}
 & & 100 \text{ varas} = x \\
 1 \text{ vara} & = & 395,25 \text{ lines} \\
 336 \text{ lines} & = & 1 \text{ archine} \\
 & & \text{Result 117,63 archines.}
 \end{array}$$



## TABLE IX.

*The Length in English Lines of the several Long Measures, and the Relation of Foreign Measures to 100 English Feet.*

## LONG MEASURE.

| Places.               | Measures.              | Length<br>of each<br>measure. | Equiv.<br>to 100<br>feet. |
|-----------------------|------------------------|-------------------------------|---------------------------|
|                       |                        | Lines 100.                    | Num. 100.                 |
| Aix la Chapelle ..... | foot.....              | 136,90                        | 105,19                    |
| Amsterdam .....       | foot.....              | 134,25                        | 107,26                    |
| Anspach.....          | foot.....              | 140,63                        | 102,40                    |
| Antwerp .....         | foot.....              | 134,86                        | 106,75                    |
| Augsburg.....         | foot.....              | 139,88                        | 102,94                    |
| Basil.....            | foot.....              | 140,85                        | 102,24                    |
| Bavaria .....         | foot.....              | 105,05                        | 137,08                    |
| Bergen.....           | palm .....             | 41,87                         | 343,92                    |
| Berlin.....           | foot.....              | 146,27                        | 98,45                     |
| Bern .....            | foot.....              | 138,50                        | 103,97                    |
| Bologna.....          | paso .....             | 896,                          | 16,07                     |
| .....                 | foot.....              | 179,20                        | 80,36                     |
| Bremen.....           | foot.....              | 136,58                        | 105,43                    |
| Brescia.....          | braccio.....           | 221,06                        | 65,14                     |
| Breslau .....         | foot.....              | 134,25                        | 107,26                    |
| Briel.....            | foot.....              | 158,30                        | 90,97                     |
| Brunswick .....       | foot.....              | 134,77                        | 106,86                    |
| Brussels .....        | foot.....              | 137,43                        | 104,78                    |
| Cagliari.....         | palmo.....             | 95,67                         | 150,52                    |
| Cairo .....           | derah .....            | 262,                          | 54,96                     |
| Carara .....          | palmo.....             | 115,20                        | 125,                      |
| Castille .....        | paso .....             | 658,75                        | 21,86                     |
| .....                 | foot.....              | 131,75                        | 109,30                    |
| .....                 | palmo .....            | 98,81                         | 145,73                    |
| China .....           | foot for merchants...  | 159,80                        | 90,11                     |
| .....                 | do. for mathematicians | 157,35                        | 91,51                     |
| .....                 | kongpu for architects. | 152,45                        | 94,46                     |
| .....                 | foot land measure...   | 150,96                        | 95,39                     |
| Cleves.....           | foot.....              | 139,56                        | 103,18                    |
| Cologne.....          | foot.....              | 129,97                        | 110,80                    |
| Constantinople .....  | foot.....              | 334,50                        | 43,05                     |
| Cracow.....           | foot.....              | 168,33                        | 85,55                     |
| Dantzic.....          | foot.....              | 135,50                        | 106,27                    |
| Denmark .....         | faum.....              | 889,32                        | 16,19                     |
| .....                 | foot.....              | 148,22                        | 97,15                     |
| Dordrecht .....       | foot.....              | 170,                          | 84,71                     |
| Dresden.....          | foot.....              | 133,65                        | 107,74                    |
| Egypt.....            | derah .....            | 262,                          | 54,96                     |



## LONG MEASURE.

| Places.                        | Measures.            | Length<br>of each<br>measure. | Equiv.<br>to 100<br>feet. |
|--------------------------------|----------------------|-------------------------------|---------------------------|
|                                |                      | Lines 100                     | Num 100.                  |
| Emhden .....                   | foot.....            | 139,88                        | 102,94                    |
| England .....                  | foot.....            | 144,                          | 100,                      |
| Erfurt.....                    | foot.....            | 133,28                        | 108,05                    |
| Ferrol.....                    | codo.....            | 263,                          | 54,75                     |
|                                | foot ..              | 131,50                        | 109,50                    |
|                                | palmo .....          | 32,87                         | 438,                      |
| Florence.....                  | braccio .....        | 258,90                        | 55,62                     |
| France .....                   | toise.....           | 920,46                        | 15,64                     |
|                                | pied de roi.....     | 153,41                        | 93,86                     |
|                                | metre .....          | 472,27                        | 30,49                     |
| Frankfort on the<br>Maine..... | foot.....            | 135,30                        | 106,43                    |
| Geneva.....                    | foot .....           | 230,44                        | 62,49                     |
| Genoa .....                    | palmo .....          | 118,58                        | 121,44                    |
| Goes.....                      | foot.....            | 141,60                        | 101,70                    |
| Gottingen .....                | foot.....            | 137,43                        | 104,78                    |
| Gotha .....                    | foot.....            | 135,85                        | 106,                      |
| Greece .....                   | foot.....            | 144,68                        | 99,53                     |
| Groningen .....                | foot.....            | 137,97                        | 104,37                    |
| Halle .....                    | foot.....            | 140,63                        | 102,40                    |
| Hamburg .....                  | foot.....            | 135,30                        | 106,43                    |
| Hanover .....                  | foot.....            | 137,43                        | 104,78                    |
| Haarlem .....                  | foot.....            | 137,43                        | 104,78                    |
| Hague .....                    | foot.....            | 153,41                        | 93,86                     |
| Heidelberg .....               | foot.....            | 131,57                        | 109,44                    |
| Hildesheim .....               | foot.....            | 132,26                        | 108,88                    |
| Holland .....                  | foot.....            | 134,25                        | 107,26                    |
| Holstein .....                 | foot.....            | 140,95                        | 102,16                    |
| Inspruck .....                 | foot .....           | 150,                          | 96,                       |
| Konigsberg .....               | foot.....            | 145,32                        | 99,09                     |
| Leghorn.....                   | palmo .....          | 32,87                         | 438,                      |
|                                | braccio.....         | 258,90                        | 55,62                     |
| Leipsic.....                   | foot.....            | 133,50                        | 107,86                    |
| Leyden .....                   | foot.....            | 148,08                        | 97,24                     |
| Liege .....                    | foot.....            | 135,85                        | 106,                      |
| Lisbon .....                   | foot.....            | 159,92                        | 90,05                     |
|                                | palmo long measure . | 106,62                        | 135,06                    |
|                                | palmo short measure. | 103,56                        | 139,05                    |
| London .....                   | foot.....            | 144,                          | 100,                      |
| Louvaine .....                 | foot.....            | 134,86                        | 106,75                    |
| Lubeck.....                    | foot.....            | 137,43                        | 104,78                    |
| Lunenburg.....                 | foot.....            | 137,43                        | 104,78                    |
| Lyons.....                     | foot.....            | 161,40                        | 89,22                     |
| Magdeburg .....                | foot.....            | 133,92                        | 107,53                    |
| Manheim .....                  | foot.....            | 137,                          | 106,10                    |



## LONG MEASURE.

| Places.           | Measures.               | Length<br>of each<br>measure. | Equiv.<br>to 100<br>feet. |
|-------------------|-------------------------|-------------------------------|---------------------------|
|                   |                         | Lines 100                     | Num. 100.                 |
| Mantua .....      | braccio .....           | 219,70                        | 65,54                     |
| Mastrick .....    | foot .....              | 132,64                        | 108,57                    |
| Mecklenburg ..... | foot .....              | 137,43                        | 104,78                    |
| Mentz .....       | foot .....              | 142,23                        | 101,25                    |
| Middleburg .....  | foot .....              | 141,70                        | 101,62                    |
| Milan .....       | foot .....              | 187,50                        | 76,80                     |
| Munich .....      | foot .....              | 105,05                        | 137,08                    |
| Muscovy .....     | foot .....              | 158,                          | 91,14                     |
| Naples .....      | palmo .....             | 124,54                        | 115,62                    |
| Neufchatel .....  | foot .....              | 141,70                        | 101,62                    |
| Nuremberg .....   | foot .....              | 143,50                        | 100,35                    |
| Oldenburg .....   | foot .....              | 139,88                        | 102,94                    |
| Osnaburg .....    | foot .....              | 131,90                        | 109,17                    |
| Padua .....       | foot .....              | 167,25                        | 86,10                     |
| Palermo .....     | palmo .....             | 114,84                        | 125,39                    |
| Paris .....       | toise .....             | 920,46                        | 15,64                     |
|                   | pied de roi .....       | 153,41                        | 93,86                     |
|                   | metre .....             | 472,27                        | 30,49                     |
| Parma .....       | braccio .....           | 258,15                        | 55,78                     |
| Persia .....      | arisch .....            | 459,20                        | 31,36                     |
| Placentia .....   | braccio .....           | 258,14                        | 55,78                     |
| Pomerania .....   | foot .....              | 137,97                        | 104,37                    |
| Prague .....      | foot .....              | 142,55                        | 101,02                    |
| Ratzeburg .....   | foot .....              | 137,43                        | 104,78                    |
| Reggio .....      | braccio .....           | 250,20                        | 57,55                     |
| Revel .....       | foot .....              | 126,40                        | 113,92                    |
| Rhine .....       | foot .....              | 148,23                        | 97,15                     |
| Riga .....        | foot .....              | 129,45                        | 111,24                    |
|                   | foot of Holland .....   | 134,25                        | 107,26                    |
| Rimini .....      | braccio .....           | 256,75                        | 56,08                     |
| Rome .....        | foot .....              | 139,14                        | 103,50                    |
|                   | palmo .....             | 105,47                        | 136,53                    |
| Rostock .....     | foot .....              | 136,58                        | 105,43                    |
| Rotterdam .....   | foot .....              | 147,55                        | 97,59                     |
| Rouen .....       | foot .....              | 127,84                        | 112,64                    |
| Russia .....      | foot Rhenish .....      | 148,23                        | 97,15                     |
|                   | foot English .....      | 144,                          | 100,                      |
| Samos .....       | foot .....              | 163,40                        | 88,13                     |
| Sardinia .....    | palmo of Genoa .....    | 118,58                        | 121,44                    |
|                   | palmo of Cagliari ..... | 95,68                         | 150,50                    |
| Siam .....        | ken .....               | 453,85                        | 31,73                     |
| Stade .....       | foot .....              | 137,43                        | 104,78                    |
| Stettin .....     | foot .....              | 133,50                        | 107,86                    |
| Stockholm .....   | foot .....              | 140,20                        | 102,71                    |
| Stralsund .....   | foot .....              | 133,50                        | 107,86                    |



## LONG MEASURE.

| Places.           | Measures.  | Length<br>of each<br>measure. | Equiv.<br>to 100<br>feet. |
|-------------------|------------|-------------------------------|---------------------------|
|                   |            | Lines 100.                    | Num. 100.                 |
| Strasburg.....    | foot ..... | 136,66                        | 105,37                    |
| Sweden .....      | faum.....  | 841,20                        | 17,12                     |
|                   | foot ..... | 140,20                        | 102,71                    |
| Switzerland ..... | foot ..... | 141,70                        | 101,62                    |
| Turin .....       | foot ..... | 152,56                        | 94,39                     |
| Ulm .....         | foot ..... | 136,48                        | 105,50                    |
| Utrecht .....     | foot ..... | 128,90                        | 111,71                    |
| Valencia .....    | foot ..... | 142,72                        | 100,90                    |
| Venice .....      | foot ..... | 164,07                        | 87,77                     |
| Verden.....       | foot ..... | 137,43                        | 104,78                    |
| Verona .....      | foot ..... | 164,07                        | 87,77                     |
| Vienna .....      | foot ..... | 151,28                        | 95,18                     |
| Wirtemberg .....  | foot.....  | 137,43                        | 104,78                    |
| Wismar .....      | foot ..... | 138,93                        | 103,65                    |
| Zell.....         | foot ..... | 137,43                        | 104,78                    |
| Ziriczee .....    | foot ..... | 146,60                        | 98,23                     |
| Zurich .....      | foot ..... | 141,70                        | 101,62                    |

The following Examples will shew in what manner the proportion between the long measure of any two given countries may be ascertained.

*Examples.*

It is required to reduce 100 metres new measure of France into feet of Hamburg.

The French metre measuring 472,27 English lines, and the Hamburg foot 135,30, according to the table prefixed, I state the following equation :

$$\begin{aligned}
 &100 \text{ metres} = x \\
 &1 \text{ metre} = 472,27 \text{ lines} \\
 &135,30 \text{ lines} = 1 \text{ foot} \\
 &\text{Result } 349,05 \text{ feet.}
 \end{aligned}$$

Reduce 100 feet of Hamburg into metres of France.

$$\begin{aligned}
 &100 \text{ feet} = x \\
 &1 \text{ foot} = 135,30 \text{ lines} \\
 &472,27 \text{ lines} = 1 \text{ metre} \\
 &\text{Result } 28,65 \text{ metres.}
 \end{aligned}$$



## TABLE X.

*The Contents, in English Square Feet, of the several Land Measures, and the Relation of Foreign Measures to 100 Acres English Measure.*

## LAND MEASURE.

| Places.           | Measures.                              | Contents<br>of each<br>measure. | Equiv. to<br>100<br>acres. |
|-------------------|----------------------------------------|---------------------------------|----------------------------|
|                   |                                        | Squ. feet.                      | Num. 100.                  |
| Amsterdam .....   | morgen .....                           | 87630                           | 49,71                      |
| Basil .....       | juchart .....                          | 34368                           | 126,75                     |
| Berlin .....      | great morgen .....                     | 61182                           | 71,20                      |
|                   | little morgen .....                    | 27531                           | 158,22                     |
| Bern .....        | juchart field measure .....            | 28979                           | 150,32                     |
|                   | juchart forest measure .....           | 41729                           | 104,39                     |
| Dantzic .....     | morgen .....                           | 59927                           | 72,69                      |
| Denmark .....     | tøende-hart-korn .....                 | 118715                          | 36,69                      |
| England .....     | acre .....                             | 43560                           | 100,                       |
| Florence .....    | soccate .....                          | 53461                           | 81,48                      |
| France .....      | arpent <i>de Paris</i> .....           | 36865                           | 118,16                     |
|                   | arpent <i>des eaux et forêts</i> ..... | 55071                           | 79,10                      |
|                   | hectare .....                          | 107830                          | 40,40                      |
| Franconia .....   | morgen .....                           | 39157                           | 111,25                     |
| Geneva .....      | journée .....                          | 55707                           | 80,02                      |
| Hamburg .....     | morgen .....                           | 135941                          | 32,04                      |
| Hanover .....     | morgen .....                           | 28050                           | 155,29                     |
| Ireland .....     | acre .....                             | 70560                           | 61,73                      |
| Rhine .....       | morgen land measure .....              | 18354                           | 237,33                     |
|                   | ditto for forests .....                | 24472                           | 178,                       |
|                   | ditto for vineyards .....              | 16994                           | 256,32                     |
|                   | thauen .....                           | 13767                           | 316,40                     |
|                   | juchart .....                          | 9178                            | 474,60                     |
| Russia .....      | dessatina .....                        | 124620                          | 34,95                      |
| Saxony .....      | acker .....                            | 59450                           | 73,27                      |
|                   | morgen, Dresden measure .....          | 29725                           | 146,54                     |
| Schleswig .....   | pfluge .....                           | 190350                          | 22,88                      |
| Scotland .....    | acre .....                             | 55354                           | 78,70                      |
| Spain .....       | fanegada .....                         | 48215                           | 90,35                      |
|                   | aranzada .....                         | 40514                           | 107,52                     |
| Sweden .....      | tuna land measure .....                | 53218                           | 81,85                      |
| Switzerland ..... | fauxe .....                            | 70818                           | 61,51                      |
|                   | morgen .....                           | 35409                           | 123,02                     |
| Vienna .....      | jochen .....                           | 63728                           | 68,35                      |
| Wirtemberg .....  | great morgen .....                     | 61182                           | 71,20                      |
|                   | little morgen .....                    | 35849                           | 121,51                     |
| Zurich .....      | juchart .....                          | 34941                           | 124,67                     |
|                   | ditto for forests .....                | 38823                           | 112,20                     |



The following Examples will shew in what manner the proportion between the land measures of any two given countries may be ascertained.

*Examples.*

It is required to reduce 100 dessaetinas of Russia into fanegadas of Spain.

The dessaetina measuring 124620 square feet of England, and the fanegada 48215, according to the table prefixed, I state the following equation :

$$\begin{array}{rcl}
 & 100 \text{ dessaetinas} & = x \\
 1 \text{ dessaetina} & = & 124620 \text{ square feet} \\
 48215 \text{ square feet} & = & 1 \text{ fanegada} \\
 & & \text{Result 258,47 fanegadas.}
 \end{array}$$

Reduce 100 fanegadas into dessaetinas.

$$\begin{array}{rcl}
 & 100 \text{ fanegadas} & = x \\
 1 \text{ fanegada} & = & 48215 \text{ square feet} \\
 124620 \text{ square feet} & = & 1 \text{ dessaetina} \\
 & & \text{Result 38,69 dessaetinas.}
 \end{array}$$



## TABLE XI.

*The Length in English Feet of the several Itinerary Measures, and the Relation of those Measures to 1 Degree of the Terrestrial Meridian, equal to 364420 English Feet,*

## ITINERARY MEASURE.

| Places.           | Measures.              | Length of each measure.<br>Feet. | Equiv. to 1 degree.<br>Num. 100. |
|-------------------|------------------------|----------------------------------|----------------------------------|
| Arabia .....      | milla .....            | 6441                             | 56,58                            |
| Brandenburg ..... | meile .....            | 34725                            | 10,50                            |
| Denmark .....     | mil .....              | 24704                            | 14,75                            |
| England .....     | mile by land .....     | 5280                             | 69,02                            |
|                   | mile by sea .....      | 6073 $\frac{2}{3}$               | 60,                              |
|                   | league marine .....    | 18221                            | 20,                              |
| Flanders .....    | mille .....            | 20587                            | 17,70                            |
| France .....      | lieue terrestre .....  | 14576 $\frac{4}{5}$              | 25,                              |
|                   | lieue moyenne .....    | 16398                            | 22,22                            |
|                   | lieue de poste .....   | 12784                            | 28,50                            |
|                   | lieue marine .....     | 18221                            | 20,                              |
|                   | myriametre .....       | 32797                            | 11,11                            |
| Germany .....     | meile .....            | 20587                            | 17,70                            |
|                   | meile geographical ..  | 24294 $\frac{2}{3}$              | 15,                              |
| Hamburg .....     | meile .....            | 24704                            | 14,75                            |
| Holland .....     | meile .....            | 19212                            | 18,97                            |
| Hungary .....     | meile .....            | 27378                            | 13,31                            |
| India .....       | parasang .....         | 12147 $\frac{1}{3}$              | 30,                              |
| Ireland .....     | mile .....             | 9110 $\frac{1}{2}$               | 40,                              |
| Italy .....       | milla .....            | 6073 $\frac{2}{3}$               | 60,                              |
| Lithuania .....   | meile .....            | 29336                            | 12,42                            |
| Persia .....      | parasang .....         | 16356                            | 22,28                            |
| Poland .....      | meile .....            | 18221                            | 20,                              |
| Portugal .....    | legua .....            | 20245 $\frac{5}{9}$              | 18,                              |
| Prussia .....     | meile .....            | 25409                            | 14,34                            |
| Russia .....      | werste .....           | 3500                             | 104,12                           |
| Saxony .....      | meile .....            | 29700                            | 12,27                            |
| Scotland .....    | mile .....             | 5952                             | 61,23                            |
| Silesia .....     | meile .....            | 21250                            | 17,15                            |
| Spain .....       | legua of Castille .... | 21958                            | 16,60                            |
|                   | legua juridica .....   | 13724                            | 26,55                            |
|                   | legua maritima .....   | 18221                            | 20,                              |
|                   | milla maritima .....   | 6073 $\frac{2}{3}$               | 60,                              |
| Sweden .....      | mile .....             | 35050                            | 10,40                            |
| Switzerland ..... | meile .....            | 27450                            | 13,28                            |
| Turkey .....      | berri .....            | 5476                             | 66,55                            |



The following Example will shew in what manner the proportion between the itinerary measures of any two given countries may be ascertained.

*Example.*

Reduce 1 myriametre new French measure into miles of England.

The length of the myriametre being 32797 English feet, and that of the mile 5280, I state the following equation :

$$1 \text{ myriametre} = x$$

$$1 \text{ myriametre} = 32797 \text{ feet}$$

$$5280 \text{ feet} = 1 \text{ mile}$$

Result 6,21 miles.

|       |       |       |               |
|-------|-------|-------|---------------|
| 58.58 | 5417  | ..... | Algeria       |
| 10.50 | 34725 | ..... | Brabant       |
| 14.75 | 24704 | ..... | Denmark       |
| 60.92 | 5280  | ..... | England       |
| 60.   | 60787 | ..... | France        |
| 20.   | 18231 | ..... | Germany       |
| 17.70 | 20587 | ..... | Holland       |
| 25.   | 14570 | ..... | Italy         |
| 22.92 | 16398 | ..... | Japan         |
| 28.50 | 12784 | ..... | Prussia       |
| 20.   | 18231 | ..... | Russia        |
| 11.11 | 32797 | ..... | Spain         |
| 17.70 | 20587 | ..... | Sweden        |
| 15.   | 24204 | ..... | Switzerland   |
| 14.75 | 24704 | ..... | Turkey        |
| 18.97 | 10212 | ..... | United States |
| 13.31 | 27378 | ..... | West Indies   |
| 30.   | 12147 | ..... | Yokohama      |
| 40.   | 9110  | ..... |               |
| 60.   | 60787 | ..... |               |
| 12.48 | 20338 | ..... |               |
| 22.78 | 16356 | ..... |               |
| 20.   | 18231 | ..... |               |
| 18.   | 20242 | ..... |               |
| 14.84 | 24408 | ..... |               |
| 10.12 | 3800  | ..... |               |
| 12.97 | 20700 | ..... |               |
| 61.98 | 6072  | ..... |               |
| 17.16 | 21250 | ..... |               |
| 16.00 | 21000 | ..... |               |
| 28.66 | 12724 | ..... |               |
| 20.   | 18231 | ..... |               |
| 60.   | 60787 | ..... |               |
| 10.40 | 3800  | ..... |               |
| 12.98 | 20700 | ..... |               |
| 28.66 | 12724 | ..... |               |



# OF **Logarithms.**

## INSTRUCTIONS

### ON *The Use of the Table of Logarithms.*

**I**N the calculations connected with the solution of arbitrations of exchange, of operations in regard to bullion and specie, as well as in those of merchandize, we find, in general, certain fractionable numbers which involve either multiplications or divisions, or both, of a greater or less degree of difficulty. In order, therefore, to simplify such calculations, which, it may be observed, do not require any other results than those of approximation, it has been judged expedient to determine their solution by the application of logarithms, whose essential property is that of superseding the use of multiplications, and of divisions, by the simple addition or the simple subtraction of the logarithms corresponding with the natural numbers by which it would have been otherwise requisite to have multiplied or to have divided. The use of this property is evident, and must strike still more forcibly, if it be considered, that, in certain propositions, in which the dividend and the divisor consist of several numbers, we may proceed from the respective additions of the logarithms of the invariable numbers in each column, to the subtraction of the lesser sum from the greater, and obtain, by this means, fixed logarithms, which will enable us, in general, to reduce whole pages of figures to a single addition and a single subtraction, and thus to bring the calculations in question to the greatest degree of simplicity.

The use of logarithms has been but little adopted till of late years in commercial affairs, whether it be that any prejudice may have obtained that they could only be of service in the higher



branches of learning, or that not any table had been composed exclusively adapted to the use of accompting houses. The superiority, however, of calculations by logarithms to those by common arithmetic, is incontestible, since, by means of the former, not any greater difficulty occurs, in multiplications and divisions by fractional numbers, than if the operations themselves related to whole numbers: it is also more easy to verify the calculations, since it is only requisite to examine that the logarithms be rightly extracted from the table, and that the addition and subtraction be performed correctly. In a word, the use of logarithms is recommendable not only as a powerful means of simplification, but as obviating that disgust which is almost inseparable from arithmetical calculations.

To make use of logarithms, it is not necessary to know in what manner they were invented, and I shall therefore confine myself to saying a few words upon the subject, which will give an idea of their formation.

### OF ARITHMETICAL PROGRESSION.

By arithmetical progression is meant a series of terms, each of which exceeds, or is exceeded by, that which precedes it by the same given number.

For instance, the series 1 . 3 . 5 . 7 . 9 . 11 is in arithmetical progression, since each of the terms exceeds that which precedes it by the same number, which is 2. The series 11 . 9 . 7 . 5 . 3 . 1 is also in arithmetical progression, since each of the terms is exceeded by that which precedes it, and by the same number.

### OF GEOMETRICAL PROGRESSION.

Geometrical progression is that in which each term of a series contains the preceding term, or is itself contained in it, the same number of times throughout.

For instance, the series 1 . 3 . 9 . 27 . 81 . 243, &c. is in geometrical progression, since each term contains that which precedes it the same number of times, which is 3.

The series 243 . 81 . 27 . 9 . 3 . 1 is also in geometrical progression, each of the terms being contained by the preceding the same number of times.



## OF THE FORMATION OF LOGARITHMS.

Logarithms are numbers in arithmetical progression, corresponding, term by term, with a similar series of numbers in geometrical progression. If, for instance, we have a geometrical series and an arithmetical series as follows,

$$1 \cdot 3 \cdot 9 \cdot 27 \cdot 81 \cdot 243$$

$$1 \cdot 3 \cdot 5 \cdot 7 \cdot 9 \cdot 11$$

we shall call each term of the lower series the logarithm of the corresponding term in the upper series.

Any given quantity may therefore have an infinite number of different logarithms, since the same geometrical progression may be made to correspond with an infinite diversity of series in arithmetical progression.

In the formation, however, of tables of logarithms, it has been found convenient to adopt a ten-fold progression as the geometrical progression, and the series of natural numbers as the arithmetical progression. It will be remarked, that, in respect to the latter, the ratio, or common measure of increase, is always unity, while the former has the advantage of being adapted to the mode of notation which is in universal use. The following, therefore, are the progressions chosen :

$$1 \cdot 10 \cdot 100 \cdot 1000 \cdot 10000 \cdot 100000 \cdot 1000000$$

$$0 \cdot 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6$$

It follows from the nature and correspondence of these progressions, that, as often as the ratio of the former may have been used as a factor in the formation of any one of the terms of that progression, so often will the ratio of the second progression have been added to form the corresponding term of this identical second progression. For instance, in the term 10000, the ratio 10 is 4 times a factor, and in the term 4 the ratio is added 4 times.

If any two terms of the geometrical progression be inter-multiplied, and if the corresponding terms of the arithmetical progression be added, the product and the sum will be two terms which will correspond with each other in the same progressions.

Upon this principle it is, that, by the simple addition of any two or more terms of the arithmetical progression, we can ascertain the product of the corresponding terms of the geometrical progression.



For instance, by adding the terms 2 and 3, which answer to 100 and 1000, I have 5, which answers to 100000; whence I conclude that the product of 100 by 1000 is 100000, which in fact it is.

It is always easy to ascertain the logarithm of unity followed by any given number of ciphers; for such logarithm will invariably be expressed by as many units as there may be ciphers in the given number. In order to extend this practice to the formation of intermediate logarithms, it may be conceived, that, although any given number, for instance 3, may not apparently form any part of the geometrical progression 1. 10. 100, yet if we were to insert a great number of geometrical means, suppose 1,000,000, between the two first terms, we should either find the number 3 itself, as one of such means, or a number of very near approximation to it. The intermediate terms between 10. 100 and between 100. 1000 might be found in like manner, as well as a corresponding number of intermediate terms, in arithmetical proportion, between 0 and 1, and between 1 and 2, 2 and 3, &c. The whole of the geometrical terms being then arranged upon the same line, and the whole of the arithmetical terms upon another line, under the former, it is obvious that the lower series would contain units, or decimal fractions, corresponding with the numbers in the upper series, or, in other words, the logarithmic relation of the two series would be complete and exactly similar to that of the fundamental progressions.

It is thus, that, in the tables most in use, the number of decimal places in the logarithmic quantities is 7, than which, however, many more are used by men of science with a view to the attainment of a corresponding degree of precision. Nevertheless, in certain tables which were made a few years ago for the use of accompting houses, the number of decimal places is reduced to 5, and the rather, as a greater degree of precision is not necessary in those calculations of business which do not require more than approximate results.

It should be remarked, in respect to the tables of logarithms, that the first figure to the left of each logarithm is called *the characteristic*; since it is that figure which denotes the class of the geometrical progression which comprises the number to which the logarithm relates. For instance, if the characteristic of a number be 2, I know that it relates to the second class, or



the hundreds, the logarithm of 100 being 2 ; and, as that of 1000 is 3, every number, from 100 to 999 inclusively, cannot have any other logarithm than 2 and a decimal fraction.

Thus, the characteristic of a logarithm is a number corresponding to the natural numbers, namely, 1 to 10, 2 to 100, 3 to 1000, 4 to 10000, &c. &c. The characteristic of the logarithm of any number under 10 is 0.

It happens by this progressive correspondence, that a number being 10 times, 100 times, or 1000 times greater than another number, has the same logarithm as the lesser number, as far as relates to the decimal fractions of each. The characteristic alone is susceptible of variation, as will be seen by the logarithms of the following numbers :

| Numbers | Logarithms |
|---------|------------|
| 3       | 0,47712    |
| 30      | 1,47712    |
| 300     | 2,47712    |
| 3000    | 3,47712    |

the characteristics of which are separated by a comma, being 0, 1, 2, 3.

It is this property by which the extraction of logarithms is facilitated, since, if we know the logarithm of the number 30, and are desirous of finding that of 300, of 3000, or of 3, it is requisite merely to add to the characteristic of 30, or to deduct from it as many units as there may be more or less ciphers in the number whose logarithm is sought.

### CONSTRUCTION OF THE TABLE.

The tables published of late for the use of accompting houses are preceded by the negative logarithms of fractions less than unity. I have, nevertheless, omitted them as unnecessary in those calculations, in the course of this work, in which I have had recourse to logarithms.

Commencing the table by the number 1, I have divided each unit, to the number 30 inclusively, into twentieths. Within those numbers are comprised the general rate of exchange of London upon Holland in current florins, that of London upon France in livres tournois, and that of France upon Spain also in livres tournois ; and as the florin and the livre tournois are both divided into twenty parts, the divisions of unity in the table are the same as those of unity in those exchanges.



In like manner, as the exchange of London upon Holland in florins banco, and the exchange of London upon Hamburg in marcs banco, are resolved into shillings Flemish, while the fractions arising from those exchanges cannot be any other than fractions of grotes or half grotes, I have divided each unit, from the number 31 to the number 42, into twenty-fourths; since it is upon numbers between those just mentioned that the two exchanges referred to generally revolve.

Proceeding from the number 43, the fractions of exchanges are, in fact, not more minute than eighths; however, in order to facilitate either the calculation of the charges or the extraction of the logarithms corresponding with the numbers which denote the price of bullion and specie, I have divided the unit into sixteenths, and have extended such division to the number 120.

From 121 to 150, the unit is divided into eighths; from 151 to 289 into fourths; from 290 to 299 into halves.

Proceeding from the number 300, the logarithms of whole numbers are continued to 2999.

Each page of the table of logarithms consists of twelve columns, six of which are of numbers or of fractions corresponding respectively to a column of logarithms.

It will be observed, that, from 1 to 299, the natural numbers are inserted at the head of the page or of the several sections; and, below, in columns to the left, are inserted the intermediate fractions between one number and another. To the right of the same fractions are found, upon the same line, the logarithms of the numbers at the head of the page or of the sections inclusively of the fractions.

Proceeding from the number 7, I have left in blank the three first figures to the left of the greatest part of the logarithms, after having written them once. By such omission it is intended to render the progression of the same figures more easy of apprehension, and, consequently, to facilitate the search for the logarithms. Nevertheless, in extracting them, it is essential to connect the three figures upon the left with the three figures upon the right. For instance, if the exchange of London upon Paris be 24 11, the logarithm of such number is written 139005; but, if the exchange be 24 12, the three figures of the corresponding logarithm are 094. It remains, therefore, in this case, to prefix, in the extraction, the three figures to the left of the pre-



ceding logarithm, which will give 139094 as the logarithm of 24 12.

In like manner, supposing the logarithm 200966 to be the result of an operation, and, in order to find the corresponding natural number, I follow in the table the progression of the three figures to the left, and having reached the number 200, I then follow the progression of the three figures to the right, and, pausing at 966, I connect those figures with the figures to the left at which I began, that is 200 with 966, and I perceive that the logarithm 200966 corresponds with the natural number  $102\frac{4}{16}$ , or  $102\frac{1}{4}$ .

### MANNER OF USING THE TABLE.

*To find the Logarithm of a Number between 1 and 30.*

The exchange of London upon Amsterdam in current florins is at 12. Required its logarithm.

I look among the numbers which are at the head of the pages or of the sections, and, in one of the sections of page 510, I find the number 12. Underneath is a logarithm, which has a cipher to the left instead of a fraction: it is the identical logarithm required, expressed by the figures 107918.

The exchange of London upon Paris is at 25 13. What is its logarithm?

I discover in page 512, at the head of the second column, the number 25, and, as the divisions of unity are the same in the table as in the money of exchange, I descend in the column of fractions to 13, where I find upon the same line 140909, or the logarithm of 25 13.

*To find the Logarithm of a Number between 31 and 42.*

The exchange of London upon Hamburg is at 35 9½. What is its logarithm?

I stop at the number 35, and, as the fraction 9½ is equivalent to 19 half grotes, or  $\frac{19}{2}$ , the unit being divided into 24 parts, I descend in the column of fractions to 19, and I find to the right 155378 as the logarithm of 35 9½. If the exchange had not been more than 35 9, I should have stopped in the column of fractions at 18, representing 18 half grotes or 9 grotes. It is therefore necessary, in seeking the logarithm of the exchanges of



London upon Hamburg and upon Amsterdam, to double the number of grotes.

The exchange of London upon Spain is at  $34\frac{5}{8}$ . What is its logarithm?

I descend in the column of fractions below the number 34. Stopping at 15, which represents the fraction  $\frac{1}{2}\frac{5}{4}$ , equivalent to  $\frac{5}{8}$ , I find upon the same line 153939 as the logarithm of  $34\frac{5}{8}$ . In the exchange of London upon Spain, the fractions used do not exceed eighths. It will therefore be easy to find the logarithm of such exchange whenever it may be partly expressed by eighths, since, according to the preceding example, it will be only requisite to treble the terms of the fraction, or even its numerator only. In respect to other fractions, it is known that  $\frac{1}{4}$  corresponds with  $\frac{6}{24}$ ,  $\frac{1}{2}$  with  $\frac{12}{24}$ ,  $\frac{3}{4}$  with  $\frac{18}{24}$ .

*To find the Logarithm of a Number between 43 and 120.*

The exchange of London upon Lisbon is at  $61\frac{1}{2}$ . What is its logarithm?

Under the number 61, I stop in the column of fractions at 14, representing the fraction  $\frac{1}{2}\frac{1}{4}$ , equivalent to  $\frac{1}{2}$ , and I find 179152 as the logarithm of  $61\frac{1}{2}$ . If the fraction annexed to the exchange had been  $\frac{3}{4}$ , I should have stopped at 12, representing  $\frac{1}{2}\frac{3}{4}$ .

As the extraction of the logarithms of the several numbers from 121 to 2999 cannot fail of being very easy, after the preceding examples, I shall not enlarge upon the subject.

*To find the Number corresponding to a Logarithm.*

What is the number corresponding to the logarithm 138021?

I trace the progression of the three figures to the left of the logarithm, which brings me to page 511, and, at the section of the 12th column, on the line below, is the very logarithm in question. At the head of the section is the number 24, in the margin of the logarithm is a cipher in the fractions-place; therefore 24 is the natural number corresponding to the logarithm 138021.

Required the number corresponding to the logarithm 154819.

Following the progression of the three figures to the left of the logarithm, I discover, under the number 35, to the right



of 8 in the column of fractions, the logarithm 154819; hence,  $35\frac{8}{24}$  is the number corresponding to the logarithm 154819. The fraction  $\frac{8}{24}$  is reducible to  $\frac{1}{3}$ , or 4 grotes, if the number represent the exchange of London upon Hamburg; or it may be reduced to  $\frac{1}{3}$ , in regard to the exchange of London upon Spain.

Required the number corresponding to the logarithm 179301.

Following the progression of the three first figures of the logarithm, I stop at page 514, and in the column under the number 62, I find that the fraction  $\frac{1}{16}$  corresponds to 17928, and the following fraction to 179327. The fraction  $\frac{1}{16}$  is that which approaches the nearest, and therefore  $62\frac{1}{16}$  is to be considered as the number corresponding to the logarithm 179301.

The preceding examples, and the practical application of logarithms to the several calculations comprised in this work, appear to me to render unnecessary any further explanation as to the method of finding the correspondence of numbers to logarithms.

### OF MULTIPLICATION BY LOGARITHMS.

In order to multiply by logarithms, it is necessary to add the logarithm of the multiplicand to the logarithm of the multiplier; the sum will be the logarithm of the product: so that, by referring to such sum among the logarithms in the table, the product in natural numbers will be found in correspondence.

#### *Example.*

The exchange of London upon Hamburg is  $36\frac{1}{2}$ , and that of London upon Lisbon is  $63\frac{3}{8}$ . What is the product of those numbers?

I look in the table for the number 36, and, in the column of fractions beneath it, I stop at 5, which indicates  $2\frac{1}{2}$  grotes, or  $\frac{5}{24}$ . I find upon the same line the logarithm 155881.

I look, in like manner, for the number 63, and descending to the fraction  $\frac{3}{8}$ , equal to  $\frac{3}{8}$ , I perceive that the corresponding logarithm is 180192.

The logarithm of  $36\frac{1}{2}$  is therefore ..... 155881

The logarithm of  $63\frac{3}{8}$  is ..... 180192

Their sum is ..... 336073



Referring to the table for the natural number corresponding to that logarithm, I find that the number which approaches the nearest to it is 2295.

I should have obtained the same product by the arithmetical multiplication of  $36\frac{1}{2}$  by  $63\frac{3}{8}$ .

### OF DIVISION BY LOGARITHMS.

To find the quotient of the division of a number by another number, it is necessary to deduct the logarithm of the divisor from the logarithm of the dividend: the number corresponding to the remaining logarithm, and which is to be found in the table, will be the quotient.

#### *Example.*

It is required to divide the number 2295 by  $35\frac{3}{4}$ .

I look in the table for the number 2295, and I find its logarithm to be 336078.

I look, in like manner, for the number  $35\frac{3}{4}$ , and stopping, in the column of fractions below 35, at 18, representing the fraction  $\frac{18}{4}$ , or  $\frac{9}{2}$ , I have the logarithm 155328.

The logarithm of 2295 is therefore..... 336078

The logarithm of  $35\frac{3}{4}$  is..... 155328

The remaining logarithm is ..... 180750

Looking in the table for the number corresponding to the logarithm 180750, I find that the number which approaches the nearest to it is  $64\frac{3}{16}$ ; wherefore  $64\frac{3}{16}$  is the quotient of 2295 divided by  $35\frac{3}{4}$ .

I should have obtained the same quotient by the arithmetical division of 2295 by  $35\frac{3}{4}$ .

### OF MULTIPLICATION AND OF DIVISION BY LOGARITHMS.

These operations, when connected, are performed by adding the logarithms of the multiplicand and of the multiplier, and by deducting from their sum the logarithm of the divisor.



*Example.*

It is required to multiply  $57\frac{9}{16}$  by  $109\frac{5}{8}$ , and to divide the product by  $52\frac{1}{2}$ .

$$\begin{array}{r}
 57\frac{9}{16} = 176014 \text{ multiplicand} \\
 109\frac{5}{8} + 203991 \text{ multiplier} \\
 \hline
 380005 \\
 52\frac{1}{2} - 172016 \text{ divisor} \\
 \hline
 207989 = 120\frac{3}{16} \text{ quotient.}
 \end{array}$$

In this example, after having extracted the logarithm of  $57\frac{9}{16}$ , the multiplication is implicitly effected, by adding the logarithm of  $109\frac{5}{8}$ ; and, having found the sum to be 380005, or the logarithm corresponding to the product of the multiplication of the two numbers, it only remains to make the division, which is effected by deducting at once the logarithm of  $52\frac{1}{2}$ , leaving a remainder of 207989, which is found to correspond in the table to the number  $120\frac{3}{16}$ .

If I had multiplied  $57\frac{9}{16}$  by  $109\frac{5}{8}$ , and then divided the product by  $52\frac{1}{2}$ , I should have obtained the identical quotient of  $120\frac{3}{16}$ . Indeed, by effecting those operations arithmetically, it is impossible not to feel how much is accomplished, in point of simplification, by the application of logarithms.

The numerous examples of multiplication and of division by logarithms, comprised in the several parts of this work, enable me to dispense with further detail upon the subject; I shall therefore confine myself to observing, that, as the units are not divided, in the beginning of the table, into a great number of fractions, the results obtained by the use of the natural numbers in relation to the logarithms are not rigorously exact; but, as the end of those calculations of commerce, to which the logarithms are applied, is only to ascertain, by approximate results, whether an operation be feasible, it is seldom requisite to observe a greater degree of precision.

### OF FRACTIONAL NUMBERS WHOSE LOGARITHMS ARE NOT IN THE TABLE.

The table being constructed chiefly with reference to arbitrations of exchange, it is expedient to anticipate those cases, in



which, by reason of any considerable variation, the fractions of the principal units may not correspond with those in the table.

The general rule to find the logarithm of a whole number, with any fraction whatever annexed to it, is to reduce the fractional number into an improper fraction, and then to deduct the logarithm of the denominator from the logarithm of the new numerator. The remainder will be the logarithm required.

*Example I.*

The exchange of London upon Hamburg is 30 11. What is its logarithm?

The unit relative to the number 30 is divided, in the table, into 20 parts, and is therefore not adapted to furnishing the logarithm of  $30\frac{1}{2}$ . According to the rule abovementioned, I reduce the fractional number  $30\frac{1}{2}$  into an improper fraction, being  $\frac{371}{12}$ : from 256937, or the logarithm of 371, I deduct 107918, the logarithm of 12; the remainder, 149019, is the logarithm of  $30\frac{1}{2}$ .

*Example II.*

The exchange of Madrid upon Paris is 15 5 5. Required its logarithm.

According to the general rule, the whole should be reduced to a fraction, which gives 3665 deniers, or  $\frac{3665}{240}$ , and then the logarithm of 240 should be deducted from that of 3665. But, as the limits of the table do not exceed 2999, it is expedient to adopt the method which I have pointed out in page 176; that is, to take the logarithm of 15 5, and to add to it  $\frac{5}{12}$  of the difference between such logarithm and the logarithm of 15 6; and it need not be said, that the logarithmic quantity of  $\frac{5}{12}$  can be easily ascertained by multiplying the difference by 5, and by dividing the product by 12.

|                               |   |               |
|-------------------------------|---|---------------|
| Logarithm of 15 5             | = | 118327        |
| Difference for $\frac{5}{12}$ | + | 59            |
| Logarithm of 15 5 5           |   | <u>118386</u> |

OF WHOLE NUMBERS FOLLOWED BY DECIMAL FRACTIONS.

To find the logarithm of a whole number annexing a decimal fraction, it is necessary to suppress the comma which marks the decimal places; to extract the logarithm of the whole number



which is the result of the suppression ; and to deduct from the characteristic of such logarithm as many units as there may be decimal places in the original number.

*Example.*

The exchange of Bordeaux upon London is 25 francs 57 cents, or 25,57. Required its logarithm.

After suppressing the comma, I find the logarithm of 2557 to be 340773, and, as there are two decimal places in the original number, I deduct 2 from the characteristic 3 ; the logarithm of 25,57 is, therefore, 140773.

In fact, by the suppression of the comma, I have rendered the number 25,57 an hundred times greater than its original import, and the same excess is of course transferred to the logarithm. But, by afterwards deducting two units from the characteristic 3, I have rendered the same logarithm an hundred times less, whereby the corresponding natural number becomes reduced in the same proportion : the implied process, therefore, is no other than that of converting the fractional number 25,57 into the fraction  $\frac{2557}{100}$ , and deducting the logarithm of the denominator from the logarithm of the new numerator.

This method, so very simple, may be adapted to the exchanges of Genoa and of Leghorn upon France, whenever they may be quoted in francs, as well as to every other number followed by decimals.

Before I conclude these instructions, I shall observe, that, in order not to add too much to the bulk of this work, and to facilitate, at the same time, the extraction of the logarithms, as well as their application to the several calculations comprised in it, I have confined myself to the insertion, in this place, of a table, short and simple, yet sufficient for the solution, either rigorously or by approximation, of all the calculations to which I have applied the logarithms.



# Tables of Logarithms.

|    | 1      |    | 2      |    | 3      |    | 4      |    | 5      |    | 6      |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 000000 | 0  | 030103 | 0  | 047712 | 0  | 060206 | 0  | 069897 | 0  | 077815 |
| 1  | 002119 | 1  | 031175 | 1  | 048430 | 1  | 060746 | 1  | 070329 | 1  | 078176 |
| 2  | 004139 | 2  | 032222 | 2  | 049136 | 2  | 061278 | 2  | 070757 | 2  | 078533 |
| 3  | 006070 | 3  | 033244 | 3  | 049831 | 3  | 061805 | 3  | 071181 | 3  | 078888 |
| 4  | 007918 | 4  | 034242 | 4  | 050515 | 4  | 062225 | 4  | 071600 | 4  | 079239 |
| 5  | 009691 | 5  | 035218 | 5  | 051188 | 5  | 062839 | 5  | 072016 | 5  | 079588 |
| 6  | 011394 | 6  | 036173 | 6  | 051851 | 6  | 063347 | 6  | 072428 | 6  | 079934 |
| 7  | 013033 | 7  | 037107 | 7  | 052504 | 7  | 063849 | 7  | 072835 | 7  | 080277 |
| 8  | 014612 | 8  | 038021 | 8  | 053148 | 8  | 064345 | 8  | 073239 | 8  | 080618 |
| 9  | 016137 | 9  | 038917 | 9  | 053782 | 9  | 064836 | 9  | 073640 | 9  | 080956 |
| 10 | 017609 | 10 | 039794 | 10 | 054407 | 10 | 065321 | 10 | 074036 | 10 | 081291 |
| 11 | 019032 | 11 | 040654 | 11 | 055023 | 11 | 065801 | 11 | 074429 | 11 | 081624 |
| 12 | 020412 | 12 | 041497 | 12 | 055630 | 12 | 066276 | 12 | 074819 | 12 | 081954 |
| 13 | 021748 | 13 | 042325 | 13 | 056229 | 13 | 066745 | 13 | 075205 | 13 | 082282 |
| 14 | 023045 | 14 | 043136 | 14 | 056820 | 14 | 067210 | 14 | 075587 | 14 | 082607 |
| 15 | 024304 | 15 | 043933 | 15 | 057403 | 15 | 067669 | 15 | 075967 | 15 | 082930 |
| 16 | 025527 | 16 | 044716 | 16 | 057978 | 16 | 068124 | 16 | 076343 | 16 | 083251 |
| 17 | 026717 | 17 | 045484 | 17 | 058546 | 17 | 068574 | 17 | 076716 | 17 | 083569 |
| 18 | 027875 | 18 | 046240 | 18 | 059106 | 18 | 069020 | 18 | 077085 | 18 | 083885 |
| 19 | 029003 | 19 | 046982 | 19 | 059660 | 19 | 069461 | 19 | 077452 | 19 | 084198 |
|    | 7      |    | 8      |    | 9      |    | 10     |    | 11     |    | 12     |
| 0  | 084510 | 0  | 090309 | 0  | 095424 | 0  | 100000 | 0  | 104139 | 0  | 107918 |
| 1  | 819    | 1  | 580    | 1  | 665    | 1  | 217    | 1  | 336    | 1  | 108099 |
| 2  | 085126 | 2  | 849    | 2  | 904    | 2  | 432    | 2  | 532    | 2  | 279    |
| 3  | 431    | 3  | 091110 | 3  | 096142 | 3  | 647    | 3  | 727    | 3  | 458    |
| 4  | 733    | 4  | 381    | 4  | 379    | 4  | 860    | 4  | 922    | 4  | 636    |
| 5  | 086034 | 5  | 645    | 5  | 614    | 5  | 101072 | 5  | 105115 | 5  | 814    |
| 6  | 332    | 6  | 908    | 6  | 848    | 6  | 284    | 6  | 308    | 6  | 991    |
| 7  | 629    | 7  | 092169 | 7  | 097081 | 7  | 494    | 7  | 500    | 7  | 109167 |
| 8  | 923    | 8  | 428    | 8  | 313    | 8  | 702    | 8  | 690    | 8  | 342    |
| 9  | 087216 | 9  | 686    | 9  | 542    | 9  | 912    | 9  | 881    | 9  | 517    |
| 10 | 506    | 10 | 942    | 10 | 772    | 10 | 102119 | 10 | 106070 | 10 | 691    |
| 11 | 795    | 11 | 093197 | 11 | 098000 | 11 | 325    | 11 | 258    | 11 | 864    |
| 12 | 088081 | 12 | 450    | 12 | 227    | 12 | 531    | 12 | 446    | 12 | 110037 |
| 13 | 366    | 13 | 702    | 13 | 453    | 13 | 735    | 13 | 633    | 13 | 209    |
| 14 | 649    | 14 | 952    | 14 | 677    | 14 | 938    | 14 | 819    | 14 | 380    |
| 15 | 930    | 15 | 094201 | 15 | 900    | 15 | 103141 | 15 | 107004 | 15 | 551    |
| 16 | 089209 | 16 | 448    | 16 | 099123 | 16 | 342    | 16 | 188    | 16 | 721    |
| 17 | 487    | 17 | 694    | 17 | 344    | 17 | 543    | 17 | 372    | 17 | 890    |
| 18 | 763    | 18 | 939    | 18 | 564    | 18 | 743    | 18 | 555    | 18 | 111059 |
| 19 | 090037 | 19 | 095182 | 19 | 782    | 19 | 941    | 19 | 737    | 19 | 227    |



|    | 13     |    | 14     |    | 15     |    | 16     |    | 17     |    | 18     |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 111394 | 0  | 114613 | 0  | 117609 | 0  | 120412 | 0  | 123045 | 0  | 125527 |
| 1  | 561    | 1  | 768    | 1  | 754    | 1  | 548    | 1  | 172    | 1  | 648    |
| 2  | 727    | 2  | 922    | 2  | 898    | 2  | 683    | 2  | 300    | 2  | 768    |
| 3  | 893    | 3  | 115076 | 3  | 118041 | 3  | 817    | 3  | 426    | 3  | 888    |
| 4  | 112057 | 4  | 229    | 4  | 184    | 4  | 952    | 4  | 553    | 4  | 126007 |
| 5  | 222    | 5  | 381    | 5  | 327    | 5  | 121085 | 5  | 679    | 5  | 126    |
| 6  | 385    | 6  | 534    | 6  | 469    | 6  | 219    | 6  | 805    | 6  | 245    |
| 7  | 548    | 7  | 685    | 7  | 611    | 7  | 352    | 7  | 930    | 7  | 364    |
| 8  | 710    | 8  | 836    | 8  | 752    | 8  | 484    | 8  | 124055 | 8  | 482    |
| 9  | 872    | 9  | 987    | 9  | 893    | 9  | 617    | 9  | 180    | 9  | 600    |
| 10 | 113033 | 10 | 116137 | 10 | 119033 | 10 | 748    | 10 | 304    | 10 | 717    |
| 11 | 194    | 11 | 286    | 11 | 173    | 11 | 880    | 11 | 428    | 11 | 834    |
| 12 | 354    | 12 | 435    | 12 | 312    | 12 | 122011 | 12 | 551    | 12 | 951    |
| 13 | 513    | 13 | 585    | 13 | 451    | 13 | 141    | 13 | 674    | 13 | 127068 |
| 14 | 672    | 14 | 732    | 14 | 590    | 14 | 272    | 14 | 797    | 14 | 184    |
| 15 | 830    | 15 | 879    | 15 | 728    | 15 | 401    | 15 | 920    | 15 | 300    |
| 16 | 988    | 16 | 117026 | 16 | 866    | 16 | 531    | 16 | 125042 | 16 | 416    |
| 17 | 114145 | 17 | 173    | 17 | 120003 | 17 | 660    | 17 | 164    | 17 | 531    |
| 18 | 301    | 18 | 319    | 18 | 140    | 18 | 789    | 18 | 285    | 18 | 646    |
| 19 | 457    | 19 | 464    | 19 | 276    | 19 | 917    | 19 | 406    | 19 | 761    |
|    | 19     |    | 20     |    | 21     |    | 22     |    | 23     |    | 24     |
| 0  | 127875 | 0  | 130103 | 0  | 132222 | 0  | 134242 | 0  | 136173 | 0  | 138021 |
| 1  | 990    | 1  | 211    | 1  | 325    | 1  | 341    | 1  | 267    | 1  | 112    |
| 2  | 128103 | 2  | 320    | 2  | 428    | 2  | 439    | 2  | 361    | 2  | 202    |
| 3  | 217    | 3  | 428    | 3  | 531    | 3  | 537    | 3  | 455    | 3  | 292    |
| 4  | 330    | 4  | 535    | 4  | 634    | 4  | 635    | 4  | 549    | 4  | 382    |
| 5  | 443    | 5  | 643    | 5  | 736    | 5  | 733    | 5  | 642    | 5  | 471    |
| 6  | 556    | 6  | 750    | 6  | 838    | 6  | 830    | 6  | 736    | 6  | 561    |
| 7  | 668    | 7  | 856    | 7  | 940    | 7  | 928    | 7  | 829    | 7  | 650    |
| 8  | 780    | 8  | 963    | 8  | 133041 | 8  | 135025 | 8  | 922    | 8  | 739    |
| 9  | 892    | 9  | 131069 | 9  | 143    | 9  | 122    | 9  | 137014 | 9  | 828    |
| 10 | 129003 | 10 | 175    | 10 | 244    | 10 | 218    | 10 | 107    | 10 | 917    |
| 11 | 115    | 11 | 281    | 11 | 345    | 11 | 315    | 11 | 199    | 11 | 139005 |
| 12 | 226    | 12 | 387    | 12 | 445    | 12 | 411    | 12 | 291    | 12 | 094    |
| 13 | 336    | 13 | 492    | 13 | 546    | 13 | 507    | 13 | 383    | 13 | 182    |
| 14 | 447    | 14 | 597    | 14 | 646    | 14 | 603    | 14 | 475    | 14 | 270    |
| 15 | 557    | 15 | 702    | 15 | 746    | 15 | 698    | 15 | 566    | 15 | 358    |
| 16 | 667    | 16 | 806    | 16 | 846    | 16 | 793    | 16 | 658    | 16 | 445    |
| 17 | 776    | 17 | 911    | 17 | 945    | 17 | 889    | 17 | 749    | 17 | 533    |
| 18 | 885    | 18 | 132015 | 18 | 134044 | 18 | 984    | 18 | 840    | 18 | 620    |
| 19 | 994    | 19 | 118    | 19 | 143    | 19 | 136078 | 19 | 931    | 19 | 707    |



|                | 25       |                | 26       |                | 7        |                | 28       |                | 29       |                | 30       |
|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|
| F.             | Log.     | F.             | Log.     | F.             | Log.     | F.             | Log.     | F.             | Log.     | F.             | Log.     |
| Twentieths     | 0 139794 | Twentieths     | 0 141497 | Twentieths     | 0 143136 | Twentieths     | 0 144716 | Twentieths     | 0 146240 | Twentieths     | 0 147712 |
| 1              | 881      | 1              | 581      | 1              | 217      | 1              | 793      | 1              | 315      | 1              | 784      |
| 2              | 967      | 2              | 664      | 2              | 297      | 2              | 871      | 2              | 389      | 2              | 857      |
| 3              | 140054   | 3              | 747      | 3              | 377      | 3              | 948      | 3              | 464      | 3              | 929      |
| 4              | 140      | 4              | 830      | 4              | 457      | 4              | 145025   | 4              | 538      | 4              | 148001   |
| 5              | 226      | 5              | 913      | 5              | 537      | 5              | 102      | 5              | 613      | 5              | 073      |
| 6              | 312      | 6              | 996      | 6              | 616      | 6              | 179      | 6              | 687      | 6              | 144      |
| 7              | 398      | 7              | 142078   | 7              | 696      | 7              | 255      | 7              | 761      | 7              | 216      |
| 8              | 483      | 8              | 160      | 8              | 775      | 8              | 332      | 8              | 835      | 8              | 287      |
| 9              | 569      | 9              | 243      | 9              | 854      | 9              | 408      | 9              | 909      | 9              | 359      |
| 10             | 654      | 10             | 325      | 10             | 933      | 10             | 484      | 10             | 982      | 10             | 430      |
| 11             | 739      | 11             | 406      | 11             | 144012   | 11             | 561      | 11             | 147056   | 11             | 501      |
| 12             | 824      | 12             | 488      | 12             | 091      | 12             | 637      | 12             | 129      | 12             | 572      |
| 13             | 909      | 13             | 570      | 13             | 170      | 13             | 712      | 13             | 202      | 13             | 643      |
| 14             | 993      | 14             | 651      | 14             | 248      | 14             | 788      | 14             | 276      | 14             | 714      |
| 15             | 141078   | 15             | 732      | 15             | 326      | 15             | 864      | 15             | 349      | 15             | 785      |
| 16             | 162      | 16             | 813      | 16             | 404      | 16             | 939      | 16             | 422      | 16             | 855      |
| 17             | 246      | 17             | 894      | 17             | 483      | 17             | 146015   | 17             | 494      | 17             | 926      |
| 18             | 330      | 18             | 975      | 18             | 560      | 18             | 090      | 18             | 567      | 18             | 996      |
| 19             | 414      | 19             | 143056   | 19             | 638      | 19             | 165      | 19             | 640      | 19             | 149066   |
|                | 31       |                | 32       |                | 33       |                | 34       |                | 35       |                | 36       |
| Twenty-fourths | 0 149136 | Twenty-fourths | 0 150515 | Twenty-fourths | 0 151851 | Twenty-fourths | 0 153148 | Twenty-fourths | 0 154407 | Twenty-fourths | 0 155630 |
| 1              | 195      | 1              | 572      | 1              | 906      | 1              | 201      | 1              | 459      | 1              | 681      |
| 2              | 253      | 2              | 628      | 2              | 961      | 2              | 254      | 2              | 510      | 2              | 731      |
| 3              | 311      | 3              | 684      | 3              | 152016   | 3              | 307      | 3              | 562      | 3              | 781      |
| 4              | 369      | 4              | 741      | 4              | 070      | 4              | 360      | 4              | 613      | 4              | 831      |
| 5              | 427      | 5              | 797      | 5              | 125      | 5              | 413      | 5              | 665      | 5              | 881      |
| 6              | 485      | 6              | 853      | 6              | 179      | 6              | 466      | 6              | 716      | 6              | 931      |
| 7              | 543      | 7              | 909      | 7              | 234      | 7              | 519      | 7              | 767      | 7              | 981      |
| 8              | 601      | 8              | 965      | 8              | 288      | 8              | 572      | 8              | 819      | 8              | 156031   |
| 9              | 658      | 9              | 151021   | 9              | 342      | 9              | 624      | 9              | 870      | 9              | 080      |
| 10             | 716      | 10             | 077      | 10             | 396      | 10             | 677      | 10             | 921      | 10             | 130      |
| 11             | 774      | 11             | 133      | 11             | 451      | 11             | 730      | 11             | 972      | 11             | 180      |
| 12             | 831      | 12             | 188      | 12             | 504      | 12             | 782      | 12             | 155023   | 12             | 229      |
| 13             | 889      | 13             | 244      | 13             | 559      | 13             | 834      | 13             | 074      | 13             | 279      |
| 14             | 946      | 14             | 300      | 14             | 613      | 14             | 887      | 14             | 125      | 14             | 328      |
| 15             | 150003   | 15             | 355      | 15             | 666      | 15             | 939      | 15             | 175      | 15             | 378      |
| 16             | 060      | 16             | 411      | 16             | 720      | 16             | 991      | 16             | 226      | 16             | 427      |
| 17             | 117      | 17             | 466      | 17             | 774      | 17             | 154044   | 17             | 277      | 17             | 477      |
| 18             | 174      | 18             | 521      | 18             | 827      | 18             | 095      | 18             | 328      | 18             | 526      |
| 19             | 231      | 19             | 576      | 19             | 881      | 19             | 148      | 19             | 378      | 19             | 575      |
| 20             | 288      | 20             | 632      | 20             | 935      | 20             | 200      | 20             | 429      | 20             | 624      |
| 21             | 345      | 21             | 687      | 21             | 988      | 21             | 251      | 21             | 479      | 21             | 673      |
| 22             | 402      | 22             | 742      | 22             | 153041   | 22             | 303      | 22             | 530      | 22             | 722      |
| 23             | 459      | 23             | 797      | 23             | 095      | 23             | 355      | 23             | 580      | 23             | 771      |



| 37 |        | 38 |        | 39 |        | 40 |        | 41 |        | 42 |        |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 156820 | 0  | 157978 | 0  | 159106 | 0  | 160206 | 0  | 161278 | 0  | 162325 |
| 1  | 869    | 1  | 158026 | 1  | 153    | 1  | 251    | 1  | 323    | 1  | 368    |
| 2  | 918    | 2  | 074    | 2  | 199    | 2  | 297    | 2  | 367    | 2  | 411    |
| 3  | 967    | 3  | 121    | 3  | 245    | 3  | 342    | 3  | 411    | 3  | 454    |
| 4  | 157015 | 4  | 169    | 4  | 292    | 4  | 387    | 4  | 455    | 4  | 497    |
| 5  | 064    | 5  | 216    | 5  | 338    | 5  | 432    | 5  | 499    | 5  | 540    |
| 6  | 113    | 6  | 263    | 6  | 384    | 6  | 477    | 6  | 542    | 6  | 583    |
| 7  | 161    | 7  | 311    | 7  | 430    | 7  | 522    | 7  | 586    | 7  | 626    |
| 8  | 210    | 8  | 358    | 8  | 476    | 8  | 567    | 8  | 630    | 8  | 668    |
| 9  | 258    | 9  | 405    | 9  | 522    | 9  | 611    | 9  | 674    | 9  | 711    |
| 10 | 307    | 10 | 452    | 10 | 568    | 10 | 656    | 10 | 718    | 10 | 754    |
| 11 | 355    | 11 | 499    | 11 | 614    | 11 | 701    | 11 | 761    | 11 | 796    |
| 12 | 403    | 12 | 546    | 12 | 660    | 12 | 746    | 12 | 805    | 12 | 839    |
| 13 | 451    | 13 | 593    | 13 | 706    | 13 | 790    | 13 | 849    | 13 | 882    |
| 14 | 500    | 14 | 640    | 14 | 751    | 14 | 835    | 14 | 892    | 14 | 924    |
| 15 | 548    | 15 | 687    | 15 | 797    | 15 | 879    | 15 | 935    | 15 | 966    |
| 16 | 596    | 16 | 734    | 16 | 843    | 16 | 924    | 16 | 979    | 16 | 163009 |
| 17 | 644    | 17 | 781    | 17 | 888    | 17 | 968    | 17 | 162022 | 17 | 051    |
| 18 | 692    | 18 | 827    | 18 | 934    | 18 | 161013 | 18 | 066    | 18 | 094    |
| 19 | 740    | 19 | 874    | 19 | 979    | 19 | 057    | 19 | 109    | 19 | 136    |
| 20 | 788    | 20 | 921    | 20 | 160025 | 20 | 102    | 20 | 152    | 20 | 178    |
| 21 | 835    | 21 | 967    | 21 | 070    | 21 | 146    | 21 | 195    | 21 | 220    |
| 22 | 883    | 22 | 159014 | 22 | 116    | 22 | 190    | 22 | 239    | 22 | 263    |
| 23 | 931    | 23 | 060    | 23 | 161    | 23 | 234    | 23 | 282    | 23 | 305    |
| 43 |        | 44 |        | 45 |        | 46 |        | 47 |        | 48 |        |
| 0  | 163347 | 0  | 164345 | 0  | 165321 | 0  | 166276 | 0  | 167210 | 0  | 168124 |
| 1  | 410    | 1  | 407    | 1  | 382    | 1  | 335    | 1  | 268    | 1  | 181    |
| 2  | 473    | 2  | 468    | 2  | 442    | 2  | 394    | 2  | 325    | 2  | 237    |
| 3  | 536    | 3  | 530    | 3  | 502    | 3  | 452    | 3  | 383    | 3  | 293    |
| 4  | 599    | 4  | 591    | 4  | 562    | 4  | 511    | 4  | 440    | 4  | 350    |
| 5  | 661    | 5  | 653    | 5  | 622    | 5  | 570    | 5  | 498    | 5  | 406    |
| 6  | 724    | 6  | 714    | 6  | 682    | 6  | 628    | 6  | 555    | 6  | 462    |
| 7  | 786    | 7  | 775    | 7  | 741    | 7  | 687    | 7  | 612    | 7  | 518    |
| 8  | 849    | 8  | 836    | 8  | 801    | 8  | 745    | 8  | 669    | 8  | 574    |
| 9  | 911    | 9  | 897    | 9  | 861    | 9  | 804    | 9  | 726    | 9  | 630    |
| 10 | 974    | 10 | 958    | 10 | 920    | 10 | 862    | 10 | 784    | 10 | 686    |
| 11 | 164036 | 11 | 165019 | 11 | 980    | 11 | 920    | 11 | 840    | 11 | 742    |
| 12 | 098    | 12 | 079    | 12 | 166039 | 12 | 978    | 12 | 897    | 12 | 797    |
| 13 | 160    | 13 | 140    | 13 | 098    | 13 | 167036 | 13 | 954    | 13 | 853    |
| 14 | 222    | 14 | 200    | 14 | 158    | 14 | 094    | 14 | 168011 | 14 | 909    |
| 15 | 284    | 15 | 261    | 15 | 217    | 15 | 152    | 15 | 068    | 15 | 964    |



|    | 49     |    | 50     |    | 51     |    | 52     |    | 53     |    | 54     |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 169020 | 0  | 169897 | 0  | 170757 | 0  | 171600 | 0  | 172428 | 0  | 173239 |
| 1  | 075    | 1  | 951    | 1  | 810    | 1  | 653    | 1  | 479    | 1  | 290    |
| 2  | 130    | 2  | 170005 | 2  | 863    | 2  | 705    | 2  | 530    | 2  | 340    |
| 3  | 185    | 3  | 060    | 3  | 916    | 3  | 757    | 3  | 581    | 3  | 390    |
| 4  | 241    | 4  | 114    | 4  | 969    | 4  | 809    | 4  | 632    | 4  | 440    |
| 5  | 296    | 5  | 168    | 5  | 171022 | 5  | 861    | 5  | 683    | 5  | 490    |
| 6  | 351    | 6  | 222    | 6  | 075    | 6  | 912    | 6  | 734    | 6  | 540    |
| 7  | 406    | 7  | 275    | 7  | 128    | 7  | 964    | 7  | 785    | 7  | 590    |
| 8  | 461    | 8  | 329    | 8  | 181    | 8  | 172016 | 8  | 835    | 8  | 640    |
| 9  | 515    | 9  | 383    | 9  | 233    | 9  | 068    | 9  | 886    | 9  | 689    |
| 10 | 570    | 10 | 437    | 10 | 286    | 10 | 119    | 10 | 937    | 10 | 739    |
| 11 | 625    | 11 | 490    | 11 | 339    | 11 | 171    | 11 | 987    | 11 | 789    |
| 12 | 679    | 12 | 544    | 12 | 391    | 12 | 222    | 12 | 173038 | 12 | 838    |
| 13 | 734    | 13 | 597    | 13 | 443    | 13 | 274    | 13 | 088    | 13 | 888    |
| 14 | 788    | 14 | 650    | 14 | 496    | 14 | 325    | 14 | 139    | 14 | 937    |
| 15 | 843    | 15 | 704    | 15 | 548    | 15 | 376    | 15 | 189    | 15 | 987    |
|    | 55     |    | 56     |    | 57     |    | 58     |    | 59     |    | 60     |
| 0  | 174036 | 0  | 174819 | 0  | 175587 | 0  | 176343 | 0  | 177085 | 0  | 177815 |
| 1  | 086    | 1  | 867    | 1  | 635    | 1  | 390    | 1  | 131    | 1  | 860    |
| 2  | 135    | 2  | 916    | 2  | 683    | 2  | 436    | 2  | 177    | 2  | 906    |
| 3  | 184    | 3  | 964    | 3  | 730    | 3  | 483    | 3  | 223    | 3  | 951    |
| 4  | 233    | 4  | 175012 | 4  | 778    | 4  | 530    | 4  | 269    | 4  | 996    |
| 5  | 282    | 5  | 060    | 5  | 825    | 5  | 576    | 5  | 315    | 5  | 178041 |
| 6  | 331    | 6  | 109    | 6  | 872    | 6  | 623    | 6  | 360    | 6  | 086    |
| 7  | 380    | 7  | 157    | 7  | 920    | 7  | 669    | 7  | 406    | 7  | 131    |
| 8  | 429    | 8  | 205    | 8  | 967    | 8  | 716    | 8  | 452    | 8  | 176    |
| 9  | 478    | 9  | 253    | 9  | 176014 | 9  | 762    | 9  | 497    | 9  | 220    |
| 10 | 527    | 10 | 301    | 10 | 061    | 10 | 808    | 10 | 543    | 10 | 265    |
| 11 | 576    | 11 | 349    | 11 | 108    | 11 | 855    | 11 | 588    | 11 | 310    |
| 12 | 624    | 12 | 397    | 12 | 155    | 12 | 901    | 12 | 634    | 12 | 355    |
| 13 | 673    | 13 | 444    | 13 | 202    | 13 | 947    | 13 | 679    | 13 | 399    |
| 14 | 722    | 14 | 492    | 14 | 249    | 14 | 993    | 14 | 725    | 14 | 444    |
| 15 | 770    | 15 | 540    | 15 | 296    | 15 | 177039 | 15 | 770    | 15 | 488    |
|    | 61     |    | 62     |    | 63     |    | 64     |    | 65     |    | 66     |
| 0  | 178533 | 0  | 179239 | 0  | 179934 | 0  | 180618 | 0  | 181291 | 0  | 181954 |
| 1  | 577    | 1  | 283    | 1  | 977    | 1  | 660    | 1  | 333    | 1  | 996    |
| 2  | 622    | 2  | 327    | 2  | 180020 | 2  | 703    | 2  | 375    | 2  | 182037 |
| 3  | 666    | 3  | 370    | 3  | 063    | 3  | 745    | 3  | 416    | 3  | 078    |
| 4  | 711    | 4  | 414    | 4  | 106    | 4  | 787    | 4  | 458    | 4  | 119    |
| 5  | 755    | 5  | 458    | 5  | 149    | 5  | 830    | 5  | 500    | 5  | 160    |
| 6  | 799    | 6  | 501    | 6  | 192    | 6  | 872    | 6  | 541    | 6  | 200    |
| 7  | 843    | 7  | 545    | 7  | 235    | 7  | 914    | 7  | 583    | 7  | 241    |
| 8  | 888    | 8  | 588    | 8  | 277    | 8  | 956    | 8  | 624    | 8  | 282    |
| 9  | 932    | 9  | 631    | 9  | 320    | 9  | 998    | 9  | 666    | 9  | 323    |
| 10 | 976    | 10 | 675    | 10 | 363    | 10 | 181040 | 10 | 707    | 10 | 364    |
| 11 | 179020 | 11 | 718    | 11 | 405    | 11 | 082    | 11 | 748    | 11 | 404    |
| 12 | 064    | 12 | 761    | 12 | 448    | 12 | 124    | 12 | 790    | 12 | 445    |
| 13 | 108    | 13 | 805    | 13 | 491    | 13 | 166    | 13 | 831    | 13 | 486    |
| 14 | 152    | 14 | 848    | 14 | 533    | 14 | 208    | 14 | 872    | 14 | 526    |
| 15 | 195    | 15 | 891    | 15 | 576    | 15 | 250    | 15 | 912    | 15 | 567    |



|    | 67     |    | 68     |    | 69     |    | 70     |    | 71     |    | 72     |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 182607 | 0  | 183251 | 0  | 183885 | 0  | 184510 | 0  | 185126 | 0  | 185733 |
| 1  | 648    | 1  | 291    | 1  | 924    | 1  | 549    | 1  | 164    | 1  | 771    |
| 2  | 688    | 2  | 331    | 2  | 964    | 2  | 587    | 2  | 202    | 2  | 809    |
| 3  | 729    | 3  | 370    | 3  | 184003 | 3  | 626    | 3  | 240    | 3  | 846    |
| 4  | 769    | 4  | 410    | 4  | 042    | 4  | 665    | 4  | 278    | 4  | 884    |
| 5  | 810    | 5  | 450    | 5  | 081    | 5  | 703    | 5  | 317    | 5  | 921    |
| 6  | 850    | 6  | 490    | 6  | 120    | 6  | 742    | 6  | 355    | 6  | 959    |
| 7  | 890    | 7  | 529    | 7  | 159    | 7  | 780    | 7  | 393    | 7  | 996    |
| 8  | 930    | 8  | 569    | 8  | 198    | 8  | 819    | 8  | 431    | 8  | 186034 |
| 9  | 971    | 9  | 609    | 9  | 238    | 9  | 857    | 9  | 469    | 9  | 071    |
| 10 | 183011 | 10 | 648    | 10 | 277    | 10 | 896    | 10 | 506    | 10 | 109    |
| 11 | 051    | 11 | 688    | 11 | 315    | 11 | 934    | 11 | 544    | 11 | 146    |
| 12 | 091    | 12 | 727    | 12 | 354    | 12 | 973    | 12 | 582    | 12 | 183    |
| 13 | 131    | 13 | 767    | 13 | 393    | 13 | 185011 | 13 | 620    | 13 | 221    |
| 14 | 171    | 14 | 806    | 14 | 432    | 14 | 049    | 14 | 658    | 14 | 258    |
| 15 | 211    | 15 | 846    | 15 | 471    | 15 | 088    | 15 | 696    | 15 | 295    |
|    | 73     |    | 74     |    | 75     |    | 76     |    | 77     |    | 78     |
| 0  | 186332 | 0  | 186923 | 0  | 187506 | 0  | 188081 | 0  | 188649 | 0  | 189209 |
| 1  | 369    | 1  | 960    | 1  | 542    | 1  | 117    | 1  | 684    | 1  | 244    |
| 2  | 407    | 2  | 996    | 2  | 578    | 2  | 153    | 2  | 720    | 2  | 279    |
| 3  | 444    | 3  | 187033 | 3  | 615    | 3  | 188    | 3  | 755    | 3  | 314    |
| 4  | 481    | 4  | 070    | 4  | 651    | 4  | 224    | 4  | 790    | 4  | 348    |
| 5  | 518    | 5  | 106    | 5  | 687    | 5  | 260    | 5  | 825    | 5  | 383    |
| 6  | 555    | 6  | 143    | 6  | 723    | 6  | 295    | 6  | 860    | 6  | 418    |
| 7  | 592    | 7  | 179    | 7  | 759    | 7  | 331    | 7  | 895    | 7  | 452    |
| 8  | 629    | 8  | 216    | 8  | 795    | 8  | 366    | 8  | 930    | 8  | 487    |
| 9  | 666    | 9  | 252    | 9  | 831    | 9  | 402    | 9  | 965    | 9  | 522    |
| 10 | 703    | 10 | 288    | 10 | 867    | 10 | 437    | 10 | 189000 | 10 | 556    |
| 11 | 739    | 11 | 325    | 11 | 902    | 11 | 472    | 11 | 035    | 11 | 591    |
| 12 | 776    | 12 | 361    | 12 | 938    | 12 | 508    | 12 | 070    | 12 | 625    |
| 13 | 813    | 13 | 397    | 13 | 974    | 13 | 543    | 13 | 105    | 13 | 660    |
| 14 | 850    | 14 | 434    | 14 | 188010 | 14 | 579    | 14 | 140    | 14 | 694    |
| 15 | 886    | 15 | 470    | 15 | 046    | 15 | 614    | 15 | 175    | 15 | 728    |
|    | 79     |    | 80     |    | 81     |    | 82     |    | 83     |    | 84     |
| 0  | 189763 | 0  | 190309 | 0  | 190849 | 0  | 191381 | 0  | 191908 | 0  | 192428 |
| 1  | 797    | 1  | 343    | 1  | 882    | 1  | 414    | 1  | 941    | 1  | 460    |
| 2  | 831    | 2  | 377    | 2  | 915    | 2  | 448    | 2  | 973    | 2  | 493    |
| 3  | 866    | 3  | 411    | 3  | 949    | 3  | 481    | 3  | 192006 | 3  | 525    |
| 4  | 900    | 4  | 445    | 4  | 982    | 4  | 514    | 4  | 038    | 4  | 557    |
| 5  | 934    | 5  | 478    | 5  | 191016 | 5  | 547    | 5  | 071    | 5  | 589    |
| 6  | 968    | 6  | 512    | 6  | 049    | 6  | 580    | 6  | 104    | 6  | 621    |
| 7  | 190003 | 7  | 546    | 7  | 082    | 7  | 612    | 7  | 136    | 7  | 654    |
| 8  | 037    | 8  | 580    | 8  | 116    | 8  | 645    | 8  | 169    | 8  | 686    |
| 9  | 071    | 9  | 613    | 9  | 149    | 9  | 678    | 9  | 201    | 9  | 718    |
| 10 | 105    | 10 | 647    | 10 | 182    | 10 | 711    | 10 | 234    | 10 | 750    |
| 11 | 139    | 11 | 681    | 11 | 216    | 11 | 744    | 11 | 266    | 11 | 782    |
| 12 | 173    | 12 | 714    | 12 | 249    | 12 | 777    | 12 | 298    | 12 | 814    |
| 13 | 207    | 13 | 748    | 13 | 282    | 13 | 810    | 13 | 331    | 13 | 846    |
| 14 | 241    | 14 | 781    | 14 | 315    | 14 | 842    | 14 | 363    | 14 | 878    |
| 15 | 275    | 15 | 815    | 15 | 348    | 15 | 875    | 15 | 396    | 15 | 910    |



|    | 85     |    | 86     |    | 87     |    | 88     |    | 89     |    | 90     |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 192942 | 0  | 193450 | 0  | 193952 | 0  | 194448 | 0  | 194939 | 0  | 195424 |
| 1  | 974    | 1  | 481    | 1  | 983    | 1  | 479    | 1  | 969    | 1  | 454    |
| 2  | 193006 | 2  | 513    | 2  | 194014 | 2  | 510    | 2  | 195000 | 2  | 485    |
| 3  | 038    | 3  | 544    | 3  | 045    | 3  | 541    | 3  | 030    | 3  | 515    |
| 4  | 069    | 4  | 576    | 4  | 077    | 4  | 571    | 4  | 061    | 4  | 545    |
| 5  | 101    | 5  | 607    | 5  | 108    | 5  | 602    | 5  | 091    | 5  | 575    |
| 6  | 133    | 6  | 639    | 6  | 139    | 6  | 633    | 6  | 122    | 6  | 605    |
| 7  | 165    | 7  | 670    | 7  | 170    | 7  | 664    | 7  | 152    | 7  | 635    |
| 8  | 197    | 8  | 702    | 8  | 201    | 8  | 694    | 8  | 182    | 8  | 665    |
| 9  | 228    | 9  | 733    | 9  | 232    | 9  | 725    | 9  | 213    | 9  | 695    |
| 10 | 260    | 10 | 764    | 10 | 263    | 10 | 756    | 10 | 243    | 10 | 725    |
| 11 | 292    | 11 | 796    | 11 | 294    | 11 | 786    | 11 | 273    | 11 | 755    |
| 12 | 323    | 12 | 827    | 12 | 325    | 12 | 817    | 12 | 303    | 12 | 785    |
| 13 | 355    | 13 | 858    | 13 | 356    | 13 | 847    | 13 | 334    | 13 | 815    |
| 14 | 387    | 14 | 889    | 14 | 387    | 14 | 878    | 14 | 364    | 14 | 844    |
| 15 | 418    | 15 | 921    | 15 | 417    | 15 | 908    | 15 | 394    | 15 | 874    |
|    | 91     |    | 92     |    | 93     |    | 94     |    | 95     |    | 96     |
| 0  | 195904 | 0  | 196379 | 0  | 196848 | 0  | 197313 | 0  | 197772 | 0  | 198227 |
| 1  | 934    | 1  | 408    | 1  | 877    | 1  | 342    | 1  | 801    | 1  | 255    |
| 2  | 964    | 2  | 438    | 2  | 907    | 2  | 371    | 2  | 829    | 2  | 284    |
| 3  | 994    | 3  | 467    | 3  | 936    | 3  | 399    | 3  | 858    | 3  | 312    |
| 4  | 196023 | 4  | 497    | 4  | 965    | 4  | 428    | 4  | 887    | 4  | 340    |
| 5  | 053    | 5  | 526    | 5  | 994    | 5  | 457    | 5  | 915    | 5  | 368    |
| 6  | 083    | 6  | 555    | 6  | 197023 | 6  | 486    | 6  | 943    | 6  | 396    |
| 7  | 112    | 7  | 585    | 7  | 052    | 7  | 514    | 7  | 972    | 7  | 425    |
| 8  | 142    | 8  | 614    | 8  | 081    | 8  | 543    | 8  | 198000 | 8  | 453    |
| 9  | 172    | 9  | 644    | 9  | 110    | 9  | 572    | 9  | 029    | 9  | 481    |
| 10 | 201    | 10 | 673    | 10 | 139    | 10 | 601    | 10 | 057    | 10 | 509    |
| 11 | 231    | 11 | 702    | 11 | 168    | 11 | 629    | 11 | 086    | 11 | 537    |
| 12 | 261    | 12 | 731    | 12 | 197    | 12 | 658    | 12 | 114    | 12 | 565    |
| 13 | 290    | 13 | 761    | 13 | 226    | 13 | 687    | 13 | 142    | 13 | 593    |
| 14 | 320    | 14 | 790    | 14 | 255    | 14 | 715    | 14 | 171    | 14 | 621    |
| 15 | 349    | 15 | 819    | 15 | 284    | 15 | 744    | 15 | 199    | 15 | 649    |
|    | 97     |    | 98     |    | 99     |    | 100    |    | 101    |    | 102    |
| 0  | 198677 | 0  | 199123 | 0  | 199564 | 0  | 200000 | 0  | 200432 | 0  | 200860 |
| 1  | 705    | 1  | 150    | 1  | 591    | 1  | 027    | 1  | 459    | 1  | 887    |
| 2  | 733    | 2  | 178    | 2  | 618    | 2  | 054    | 2  | 486    | 2  | 913    |
| 3  | 761    | 3  | 206    | 3  | 646    | 3  | 081    | 3  | 513    | 3  | 940    |
| 4  | 789    | 4  | 233    | 4  | 673    | 4  | 108    | 4  | 540    | 4  | 966    |
| 5  | 817    | 5  | 261    | 5  | 700    | 5  | 136    | 5  | 566    | 5  | 993    |
| 6  | 845    | 6  | 288    | 6  | 728    | 6  | 163    | 6  | 593    | 6  | 201019 |
| 7  | 873    | 7  | 316    | 7  | 755    | 7  | 190    | 7  | 620    | 7  | 046    |
| 8  | 900    | 8  | 344    | 8  | 782    | 8  | 217    | 8  | 647    | 8  | 072    |
| 9  | 928    | 9  | 371    | 9  | 810    | 9  | 244    | 9  | 673    | 9  | 099    |
| 10 | 956    | 10 | 399    | 10 | 837    | 10 | 271    | 10 | 700    | 10 | 125    |
| 11 | 984    | 11 | 426    | 11 | 864    | 11 | 298    | 11 | 727    | 11 | 152    |
| 12 | 199012 | 12 | 454    | 12 | 891    | 12 | 325    | 12 | 753    | 12 | 178    |
| 13 | 039    | 13 | 481    | 13 | 918    | 13 | 351    | 13 | 780    | 13 | 205    |
| 14 | 067    | 14 | 509    | 14 | 946    | 14 | 378    | 14 | 807    | 14 | 231    |
| 15 | 095    | 15 | 536    | 15 | 973    | 15 | 405    | 15 | 833    | 15 | 257    |



|    | 103    |    | 104    |    | 105    |    | 106    |    | 107    |    | 108    |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 201284 | 0  | 201703 | 0  | 202119 | 0  | 202531 | 0  | 202938 | 0  | 203342 |
| 1  | 310    | 1  | 729    | 1  | 145    | 1  | 556    | 1  | 964    | 1  | 368    |
| 2  | 336    | 2  | 756    | 2  | 171    | 2  | 582    | 2  | 989    | 2  | 393    |
| 3  | 363    | 3  | 782    | 3  | 196    | 3  | 607    | 3  | 203014 | 3  | 418    |
| 4  | 389    | 4  | 808    | 4  | 222    | 4  | 633    | 4  | 040    | 4  | 443    |
| 5  | 415    | 5  | 834    | 5  | 248    | 5  | 658    | 5  | 065    | 5  | 468    |
| 6  | 442    | 6  | 860    | 6  | 274    | 6  | 684    | 6  | 090    | 6  | 493    |
| 7  | 468    | 7  | 886    | 7  | 300    | 7  | 709    | 7  | 116    | 7  | 518    |
| 8  | 494    | 8  | 912    | 8  | 325    | 8  | 735    | 8  | 141    | 8  | 543    |
| 9  | 520    | 9  | 938    | 9  | 351    | 9  | 760    | 9  | 166    | 9  | 568    |
| 10 | 546    | 10 | 964    | 10 | 377    | 10 | 786    | 10 | 191    | 10 | 593    |
| 11 | 573    | 11 | 989    | 11 | 402    | 11 | 811    | 11 | 217    | 11 | 618    |
| 12 | 599    | 12 | 202015 | 12 | 428    | 12 | 837    | 12 | 242    | 12 | 643    |
| 13 | 625    | 13 | 041    | 13 | 454    | 13 | 862    | 13 | 267    | 13 | 668    |
| 14 | 651    | 14 | 067    | 14 | 479    | 14 | 888    | 14 | 292    | 14 | 693    |
| 15 | 677    | 15 | 093    | 15 | 505    | 15 | 913    | 15 | 317    | 15 | 718    |
|    | 109    |    | 110    |    | 111    |    | 112    |    | 113    |    | 114    |
| 0  | 203743 | 0  | 204139 | 0  | 204532 | 0  | 204922 | 0  | 205308 | 0  | 205690 |
| 1  | 768    | 1  | 164    | 1  | 557    | 1  | 946    | 1  | 332    | 1  | 714    |
| 2  | 792    | 2  | 189    | 2  | 581    | 2  | 970    | 2  | 356    | 2  | 738    |
| 3  | 817    | 3  | 213    | 3  | 606    | 3  | 994    | 3  | 380    | 3  | 762    |
| 4  | 842    | 4  | 238    | 4  | 630    | 4  | 205019 | 4  | 404    | 4  | 786    |
| 5  | 867    | 5  | 262    | 5  | 654    | 5  | 043    | 5  | 428    | 5  | 809    |
| 6  | 892    | 6  | 287    | 6  | 679    | 6  | 067    | 6  | 452    | 6  | 833    |
| 7  | 917    | 7  | 312    | 7  | 703    | 7  | 091    | 7  | 476    | 7  | 857    |
| 8  | 941    | 8  | 336    | 8  | 727    | 8  | 115    | 8  | 500    | 8  | 881    |
| 9  | 966    | 9  | 361    | 9  | 752    | 9  | 139    | 9  | 523    | 9  | 904    |
| 10 | 991    | 10 | 385    | 10 | 776    | 10 | 163    | 10 | 547    | 10 | 928    |
| 11 | 204016 | 11 | 410    | 11 | 800    | 11 | 188    | 11 | 571    | 11 | 952    |
| 12 | 040    | 12 | 434    | 12 | 825    | 12 | 212    | 12 | 595    | 12 | 975    |
| 13 | 065    | 13 | 459    | 13 | 849    | 13 | 236    | 13 | 619    | 13 | 999    |
| 14 | 090    | 14 | 483    | 14 | 873    | 14 | 260    | 14 | 643    | 14 | 206023 |
| 15 | 115    | 15 | 508    | 15 | 898    | 15 | 284    | 15 | 667    | 15 | 046    |
|    | 115    |    | 116    |    | 117    |    | 118    |    | 119    |    | 120    |
| 0  | 206070 | 0  | 206440 | 0  | 206819 | 0  | 207188 | 0  | 207555 | 0  | 207918 |
| 1  | 092    | 1  | 469    | 1  | 842    | 1  | 211    | 1  | 578    | 1  | 941    |
| 2  | 117    | 2  | 493    | 2  | 865    | 2  | 234    | 2  | 600    | 2  | 963    |
| 3  | 141    | 3  | 516    | 3  | 888    | 3  | 257    | 3  | 623    | 3  | 986    |
| 4  | 164    | 4  | 539    | 4  | 911    | 4  | 280    | 4  | 646    | 4  | 208009 |
| 5  | 188    | 5  | 563    | 5  | 934    | 5  | 303    | 5  | 669    | 5  | 031    |
| 6  | 211    | 6  | 586    | 6  | 958    | 6  | 326    | 6  | 691    | 6  | 054    |
| 7  | 235    | 7  | 609    | 7  | 981    | 7  | 349    | 7  | 714    | 7  | 076    |
| 8  | 258    | 8  | 633    | 8  | 207004 | 8  | 372    | 8  | 737    | 8  | 099    |
| 9  | 282    | 9  | 656    | 9  | 027    | 9  | 395    | 9  | 760    | 9  | 121    |
| 10 | 305    | 10 | 679    | 10 | 050    | 10 | 418    | 10 | 782    | 10 | 144    |
| 11 | 329    | 11 | 702    | 11 | 073    | 11 | 441    | 11 | 805    | 11 | 166    |
| 12 | 352    | 12 | 726    | 12 | 096    | 12 | 463    | 12 | 828    | 12 | 189    |
| 13 | 376    | 13 | 749    | 13 | 119    | 13 | 486    | 13 | 850    | 13 | 211    |
| 14 | 399    | 14 | 772    | 14 | 142    | 14 | 509    | 14 | 873    | 14 | 234    |
| 15 | 422    | 15 | 795    | 15 | 165    | 15 | 532    | 15 | 896    | 15 | 256    |



|    | 121    |    | 122    |    | 123    |    | 124    |    | 125    |    | 126    |
|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   | F. | Log.   |
| 0  | 208279 | 0  | 208636 | 0  | 208991 | 0  | 209342 | 0  | 209691 | 0  | 210037 |
| 1  | 323    | 1  | 680    | 1  | 209035 | 1  | 386    | 1  | 734    | 1  | 080    |
| 2  | 368    | 2  | 725    | 2  | 079    | 2  | 430    | 2  | 778    | 2  | 123    |
| 3  | 413    | 3  | 769    | 3  | 123    | 3  | 473    | 3  | 821    | 3  | 166    |
| 4  | 458    | 4  | 814    | 4  | 167    | 4  | 517    | 4  | 864    | 4  | 209    |
| 5  | 502    | 5  | 858    | 5  | 211    | 5  | 561    | 5  | 908    | 5  | 252    |
| 6  | 547    | 6  | 902    | 6  | 255    | 6  | 604    | 6  | 951    | 6  | 295    |
| 7  | 591    | 7  | 946    | 7  | 298    | 7  | 648    | 7  | 994    | 7  | 338    |
|    | 127    |    | 128    |    | 129    |    | 130    |    | 131    |    | 132    |
| 0  | 210380 | 0  | 210721 | 0  | 211059 | 0  | 211394 | 0  | 211727 | 0  | 212057 |
| 1  | 423    | 1  | 763    | 1  | 101    | 1  | 436    | 1  | 769    | 1  | 099    |
| 2  | 466    | 2  | 806    | 2  | 143    | 2  | 478    | 2  | 810    | 2  | 140    |
| 3  | 508    | 3  | 848    | 3  | 185    | 3  | 519    | 3  | 851    | 3  | 181    |
| 4  | 651    | 4  | 890    | 4  | 227    | 4  | 561    | 4  | 893    | 4  | 222    |
| 5  | 594    | 5  | 933    | 5  | 269    | 5  | 603    | 5  | 934    | 5  | 263    |
| 6  | 636    | 6  | 975    | 6  | 311    | 6  | 644    | 6  | 975    | 6  | 303    |
| 7  | 679    | 7  | 211017 | 7  | 353    | 7  | 686    | 7  | 212016 | 7  | 344    |
|    | 133    |    | 134    |    | 135    |    | 136    |    | 137    |    | 138    |
| 0  | 212385 | 0  | 212710 | 0  | 213033 | 0  | 213354 | 0  | 213672 | 0  | 213988 |
| 1  | 426    | 1  | 751    | 1  | 074    | 1  | 394    | 1  | 712    | 1  | 214027 |
| 2  | 467    | 2  | 791    | 2  | 114    | 2  | 434    | 2  | 751    | 2  | 067    |
| 3  | 507    | 3  | 832    | 3  | 154    | 3  | 473    | 3  | 791    | 3  | 106    |
| 4  | 548    | 4  | 872    | 4  | 194    | 4  | 513    | 4  | 830    | 4  | 145    |
| 5  | 589    | 5  | 913    | 5  | 234    | 5  | 553    | 5  | 870    | 5  | 184    |
| 6  | 629    | 6  | 953    | 6  | 274    | 6  | 593    | 6  | 909    | 6  | 223    |
| 7  | 670    | 7  | 993    | 7  | 314    | 7  | 632    | 7  | 949    | 7  | 262    |
|    | 139    |    | 140    |    | 141    |    | 142    |    | 143    |    | 144    |
| 0  | 214301 | 0  | 214613 | 0  | 214922 | 0  | 215229 | 0  | 215534 | 0  | 215836 |
| 1  | 341    | 1  | 652    | 1  | 960    | 1  | 267    | 1  | 572    | 1  | 874    |
| 2  | 380    | 2  | 690    | 2  | 999    | 2  | 305    | 2  | 609    | 2  | 912    |
| 3  | 418    | 3  | 729    | 3  | 215037 | 3  | 343    | 3  | 647    | 3  | 949    |
| 4  | 457    | 4  | 768    | 4  | 076    | 4  | 381    | 4  | 685    | 4  | 987    |
| 5  | 496    | 5  | 806    | 5  | 114    | 5  | 420    | 5  | 723    | 5  | 216024 |
| 6  | 535    | 6  | 845    | 6  | 152    | 6  | 458    | 6  | 761    | 6  | 062    |
| 7  | 574    | 7  | 883    | 7  | 191    | 7  | 496    | 7  | 799    | 7  | 099    |
|    | 145    |    | 146    |    | 147    |    | 148    |    | 149    |    | 150    |
| 0  | 216137 | 0  | 216435 | 0  | 216732 | 0  | 217026 | 0  | 217319 | 0  | 217609 |
| 1  | 174    | 1  | 472    | 1  | 769    | 1  | 063    | 1  | 355    | 1  | 645    |
| 2  | 212    | 2  | 510    | 2  | 806    | 2  | 099    | 2  | 391    | 2  | 681    |
| 3  | 249    | 3  | 547    | 3  | 842    | 3  | 136    | 3  | 428    | 3  | 718    |
| 4  | 286    | 4  | 584    | 4  | 879    | 4  | 173    | 4  | 464    | 4  | 754    |
| 5  | 324    | 5  | 621    | 5  | 916    | 5  | 209    | 5  | 500    | 5  | 790    |
| 6  | 361    | 6  | 658    | 6  | 953    | 6  | 246    | 6  | 537    | 6  | 826    |
| 7  | 398    | 7  | 695    | 7  | 989    | 7  | 282    | 7  | 573    | 7  | 862    |



| Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   |
|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|
| 151           | 217898 | 163           | 221219 | 175           | 224304 | 187           | 227184 | 199           | 229885 | 211           | 232428 |
| $\frac{1}{4}$ | 970    | $\frac{1}{4}$ | 285    | $\frac{1}{4}$ | 366    | $\frac{1}{4}$ | 242    | $\frac{1}{4}$ | 940    | $\frac{1}{4}$ | 480    |
| $\frac{1}{2}$ | 218041 | $\frac{1}{2}$ | 352    | $\frac{1}{2}$ | 428    | $\frac{1}{2}$ | 300    | $\frac{1}{2}$ | 994    | $\frac{1}{2}$ | 531    |
| $\frac{3}{4}$ | 113    | $\frac{3}{4}$ | 418    | $\frac{3}{4}$ | 490    | $\frac{3}{4}$ | 358    | $\frac{3}{4}$ | 230049 | $\frac{3}{4}$ | 582    |
| 152           | 184    | 164           | 484    | 176           | 551    | 188           | 416    | 200           | 103    | 212           | 634    |
| $\frac{1}{4}$ | 256    | $\frac{1}{4}$ | 551    | $\frac{1}{4}$ | 613    | $\frac{1}{4}$ | 474    | $\frac{1}{4}$ | 157    | $\frac{1}{4}$ | 685    |
| $\frac{1}{2}$ | 327    | $\frac{1}{2}$ | 617    | $\frac{1}{2}$ | 674    | $\frac{1}{2}$ | 531    | $\frac{1}{2}$ | 211    | $\frac{1}{2}$ | 736    |
| $\frac{3}{4}$ | 398    | $\frac{3}{4}$ | 683    | $\frac{3}{4}$ | 736    | $\frac{3}{4}$ | 589    | $\frac{3}{4}$ | 266    | $\frac{3}{4}$ | 787    |
| 153           | 469    | 165           | 748    | 177           | 797    | 189           | 646    | 201           | 320    | 213           | 838    |
| $\frac{1}{4}$ | 540    | $\frac{1}{4}$ | 814    | $\frac{1}{4}$ | 859    | $\frac{1}{4}$ | 704    | $\frac{1}{4}$ | 374    | $\frac{1}{4}$ | 889    |
| $\frac{1}{2}$ | 611    | $\frac{1}{2}$ | 880    | $\frac{1}{2}$ | 920    | $\frac{1}{2}$ | 761    | $\frac{1}{2}$ | 428    | $\frac{1}{2}$ | 940    |
| $\frac{3}{4}$ | 682    | $\frac{3}{4}$ | 945    | $\frac{3}{4}$ | 981    | $\frac{3}{4}$ | 818    | $\frac{3}{4}$ | 481    | $\frac{3}{4}$ | 991    |
| 154           | 752    | 166           | 222011 | 178           | 225042 | 190           | 875    | 202           | 535    | 214           | 233041 |
| $\frac{1}{4}$ | 823    | $\frac{1}{4}$ | 076    | $\frac{1}{4}$ | 103    | $\frac{1}{4}$ | 932    | $\frac{1}{4}$ | 589    | $\frac{1}{4}$ | 092    |
| $\frac{1}{2}$ | 893    | $\frac{1}{2}$ | 141    | $\frac{1}{2}$ | 164    | $\frac{1}{2}$ | 990    | $\frac{1}{2}$ | 643    | $\frac{1}{2}$ | 143    |
| $\frac{3}{4}$ | 963    | $\frac{3}{4}$ | 207    | $\frac{3}{4}$ | 225    | $\frac{3}{4}$ | 228046 | $\frac{3}{4}$ | 696    | $\frac{3}{4}$ | 193    |
| 155           | 219032 | 167           | 272    | 179           | 285    | 191           | 103    | 203           | 750    | 215           | 244    |
| $\frac{1}{4}$ | 103    | $\frac{1}{4}$ | 337    | $\frac{1}{4}$ | 346    | $\frac{1}{4}$ | 160    | $\frac{1}{4}$ | 803    | $\frac{1}{4}$ | 294    |
| $\frac{1}{2}$ | 173    | $\frac{1}{2}$ | 401    | $\frac{1}{2}$ | 406    | $\frac{1}{2}$ | 217    | $\frac{1}{2}$ | 856    | $\frac{1}{2}$ | 345    |
| $\frac{3}{4}$ | 243    | $\frac{3}{4}$ | 466    | $\frac{3}{4}$ | 467    | $\frac{3}{4}$ | 274    | $\frac{3}{4}$ | 910    | $\frac{3}{4}$ | 395    |
| 156           | 312    | 168           | 531    | 180           | 527    | 192           | 330    | 204           | 963    | 216           | 445    |
| $\frac{1}{4}$ | 382    | $\frac{1}{4}$ | 596    | $\frac{1}{4}$ | 588    | $\frac{1}{4}$ | 387    | $\frac{1}{4}$ | 231016 | $\frac{1}{4}$ | 496    |
| $\frac{1}{2}$ | 451    | $\frac{1}{2}$ | 660    | $\frac{1}{2}$ | 648    | $\frac{1}{2}$ | 443    | $\frac{1}{2}$ | 069    | $\frac{1}{2}$ | 546    |
| $\frac{3}{4}$ | 521    | $\frac{3}{4}$ | 724    | $\frac{3}{4}$ | 708    | $\frac{3}{4}$ | 499    | $\frac{3}{4}$ | 122    | $\frac{3}{4}$ | 596    |
| 157           | 590    | 169           | 789    | 181           | 768    | 193           | 556    | 205           | 175    | 217           | 646    |
| $\frac{1}{4}$ | 659    | $\frac{1}{4}$ | 853    | $\frac{1}{4}$ | 828    | $\frac{1}{4}$ | 612    | $\frac{1}{4}$ | 228    | $\frac{1}{4}$ | 696    |
| $\frac{1}{2}$ | 728    | $\frac{1}{2}$ | 917    | $\frac{1}{2}$ | 888    | $\frac{1}{2}$ | 668    | $\frac{1}{2}$ | 281    | $\frac{1}{2}$ | 746    |
| $\frac{3}{4}$ | 797    | $\frac{3}{4}$ | 981    | $\frac{3}{4}$ | 947    | $\frac{3}{4}$ | 724    | $\frac{3}{4}$ | 334    | $\frac{3}{4}$ | 796    |
| 158           | 866    | 170           | 223045 | 182           | 226007 | 194           | 780    | 206           | 387    | 218           | 846    |
| $\frac{1}{4}$ | 934    | $\frac{1}{4}$ | 109    | $\frac{1}{4}$ | 067    | $\frac{1}{4}$ | 836    | $\frac{1}{4}$ | 439    | $\frac{1}{4}$ | 895    |
| $\frac{1}{2}$ | 220003 | $\frac{1}{2}$ | 172    | $\frac{1}{2}$ | 126    | $\frac{1}{2}$ | 892    | $\frac{1}{2}$ | 492    | $\frac{1}{2}$ | 945    |
| $\frac{3}{4}$ | 071    | $\frac{3}{4}$ | 236    | $\frac{3}{4}$ | 186    | $\frac{3}{4}$ | 948    | $\frac{3}{4}$ | 545    | $\frac{3}{4}$ | 995    |
| 159           | 140    | 171           | 300    | 183           | 245    | 195           | 229003 | 207           | 597    | 219           | 234044 |
| $\frac{1}{4}$ | 208    | $\frac{1}{4}$ | 363    | $\frac{1}{4}$ | 304    | $\frac{1}{4}$ | 059    | $\frac{1}{4}$ | 649    | $\frac{1}{4}$ | 094    |
| $\frac{1}{2}$ | 276    | $\frac{1}{2}$ | 426    | $\frac{1}{2}$ | 364    | $\frac{1}{2}$ | 115    | $\frac{1}{2}$ | 702    | $\frac{1}{2}$ | 143    |
| $\frac{3}{4}$ | 344    | $\frac{3}{4}$ | 490    | $\frac{3}{4}$ | 423    | $\frac{3}{4}$ | 170    | $\frac{3}{4}$ | 754    | $\frac{3}{4}$ | 193    |
| 160           | 412    | 172           | 553    | 184           | 482    | 196           | 226    | 208           | 806    | 220           | 242    |
| $\frac{1}{4}$ | 480    | $\frac{1}{4}$ | 616    | $\frac{1}{4}$ | 541    | $\frac{1}{4}$ | 281    | $\frac{1}{4}$ | 859    | $\frac{1}{4}$ | 292    |
| $\frac{1}{2}$ | 548    | $\frac{1}{2}$ | 679    | $\frac{1}{2}$ | 600    | $\frac{1}{2}$ | 336    | $\frac{1}{2}$ | 911    | $\frac{1}{2}$ | 341    |
| $\frac{3}{4}$ | 615    | $\frac{3}{4}$ | 742    | $\frac{3}{4}$ | 658    | $\frac{3}{4}$ | 391    | $\frac{3}{4}$ | 963    | $\frac{3}{4}$ | 390    |
| 161           | 683    | 173           | 805    | 185           | 717    | 197           | 447    | 209           | 232015 | 221           | 439    |
| $\frac{1}{4}$ | 750    | $\frac{1}{4}$ | 867    | $\frac{1}{4}$ | 776    | $\frac{1}{4}$ | 502    | $\frac{1}{4}$ | 067    | $\frac{1}{4}$ | 488    |
| $\frac{1}{2}$ | 817    | $\frac{1}{2}$ | 930    | $\frac{1}{2}$ | 834    | $\frac{1}{2}$ | 557    | $\frac{1}{2}$ | 118    | $\frac{1}{2}$ | 537    |
| $\frac{3}{4}$ | 884    | $\frac{3}{4}$ | 992    | $\frac{3}{4}$ | 893    | $\frac{3}{4}$ | 612    | $\frac{3}{4}$ | 170    | $\frac{3}{4}$ | 586    |
| 162           | 952    | 174           | 224055 | 186           | 951    | 198           | 667    | 210           | 222    | 222           | 635    |
| $\frac{1}{4}$ | 221018 | $\frac{1}{4}$ | 117    | $\frac{1}{4}$ | 227010 | $\frac{1}{4}$ | 721    | $\frac{1}{4}$ | 274    | $\frac{1}{4}$ | 684    |
| $\frac{1}{2}$ | 085    | $\frac{1}{2}$ | 180    | $\frac{1}{2}$ | 068    | $\frac{1}{2}$ | 776    | $\frac{1}{2}$ | 325    | $\frac{1}{2}$ | 733    |
| $\frac{3}{4}$ | 152    | $\frac{3}{4}$ | 242    | $\frac{3}{4}$ | 126    | $\frac{3}{4}$ | 831    | $\frac{3}{4}$ | 377    | $\frac{3}{4}$ | 782    |



| Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   | Nu.           | Log.   |
|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|
| 223           | 234830 | 235           | 237107 | 247           | 239270 | 259           | 241330 | 271           | 243297 | 283           | 245179 |
| $\frac{1}{4}$ | 879    | $\frac{1}{4}$ | 153    | $\frac{1}{4}$ | 314    | $\frac{1}{4}$ | 372    | $\frac{1}{4}$ | 337    | $\frac{1}{4}$ | 217    |
| $\frac{1}{2}$ | 928    | $\frac{1}{2}$ | 199    | $\frac{1}{2}$ | 358    | $\frac{1}{2}$ | 414    | $\frac{1}{2}$ | 377    | $\frac{1}{2}$ | 255    |
| $\frac{3}{4}$ | 976    | $\frac{3}{4}$ | 245    | $\frac{3}{4}$ | 401    | $\frac{3}{4}$ | 456    | $\frac{3}{4}$ | 417    | $\frac{3}{4}$ | 294    |
| 224           | 235025 | 236           | 291    | 248           | 445    | 260           | 497    | 272           | 457    | 284           | 332    |
| $\frac{1}{4}$ | 073    | $\frac{1}{4}$ | 337    | $\frac{1}{4}$ | 489    | $\frac{1}{4}$ | 539    | $\frac{1}{4}$ | 497    | $\frac{1}{4}$ | 370    |
| $\frac{1}{2}$ | 122    | $\frac{1}{2}$ | 383    | $\frac{1}{2}$ | 533    | $\frac{1}{2}$ | 581    | $\frac{1}{2}$ | 537    | $\frac{1}{2}$ | 408    |
| $\frac{3}{4}$ | 170    | $\frac{3}{4}$ | 429    | $\frac{3}{4}$ | 576    | $\frac{3}{4}$ | 622    | $\frac{3}{4}$ | 576    | $\frac{3}{4}$ | 446    |
| 225           | 218    | 237           | 475    | 249           | 620    | 261           | 664    | 273           | 616    | 285           | 484    |
| $\frac{1}{4}$ | 266    | $\frac{1}{4}$ | 521    | $\frac{1}{4}$ | 664    | $\frac{1}{4}$ | 706    | $\frac{1}{4}$ | 656    | $\frac{1}{4}$ | 523    |
| $\frac{1}{2}$ | 315    | $\frac{1}{2}$ | 566    | $\frac{1}{2}$ | 707    | $\frac{1}{2}$ | 747    | $\frac{1}{2}$ | 696    | $\frac{1}{2}$ | 561    |
| $\frac{3}{4}$ | 363    | $\frac{3}{4}$ | 612    | $\frac{3}{4}$ | 751    | $\frac{3}{4}$ | 789    | $\frac{3}{4}$ | 735    | $\frac{3}{4}$ | 599    |
| 226           | 411    | 238           | 658    | 250           | 794    | 262           | 830    | 274           | 775    | 286           | 637    |
| $\frac{1}{4}$ | 459    | $\frac{1}{4}$ | 703    | $\frac{1}{4}$ | 837    | $\frac{1}{4}$ | 872    | $\frac{1}{4}$ | 815    | $\frac{1}{4}$ | 675    |
| $\frac{1}{2}$ | 507    | $\frac{1}{2}$ | 749    | $\frac{1}{2}$ | 881    | $\frac{1}{2}$ | 913    | $\frac{1}{2}$ | 854    | $\frac{1}{2}$ | 712    |
| $\frac{3}{4}$ | 555    | $\frac{3}{4}$ | 794    | $\frac{3}{4}$ | 924    | $\frac{3}{4}$ | 954    | $\frac{3}{4}$ | 894    | $\frac{3}{4}$ | 750    |
| 227           | 603    | 239           | 840    | 251           | 967    | 263           | 996    | 275           | 933    | 287           | 788    |
| $\frac{1}{4}$ | 650    | $\frac{1}{4}$ | 885    | $\frac{1}{4}$ | 240011 | $\frac{1}{4}$ | 242037 | $\frac{1}{4}$ | 973    | $\frac{1}{4}$ | 826    |
| $\frac{1}{2}$ | 698    | $\frac{1}{2}$ | 931    | $\frac{1}{2}$ | 054    | $\frac{1}{2}$ | 078    | $\frac{1}{2}$ | 244012 | $\frac{1}{2}$ | 864    |
| $\frac{3}{4}$ | 746    | $\frac{3}{4}$ | 976    | $\frac{3}{4}$ | 097    | $\frac{3}{4}$ | 119    | $\frac{3}{4}$ | 052    | $\frac{3}{4}$ | 902    |
| 228           | 793    | 240           | 238021 | 252           | 140    | 264           | 160    | 276           | 091    | 288           | 939    |
| $\frac{1}{4}$ | 841    | $\frac{1}{4}$ | 066    | $\frac{1}{4}$ | 183    | $\frac{1}{4}$ | 202    | $\frac{1}{4}$ | 130    | $\frac{1}{4}$ | 977    |
| $\frac{1}{2}$ | 889    | $\frac{1}{2}$ | 112    | $\frac{1}{2}$ | 226    | $\frac{1}{2}$ | 243    | $\frac{1}{2}$ | 170    | $\frac{1}{2}$ | 246015 |
| $\frac{3}{4}$ | 936    | $\frac{3}{4}$ | 157    | $\frac{3}{4}$ | 269    | $\frac{3}{4}$ | 284    | $\frac{3}{4}$ | 209    | $\frac{3}{4}$ | 052    |
| 229           | 984    | 241           | 202    | 253           | 312    | 265           | 325    | 277           | 248    | 289           | 090    |
| $\frac{1}{4}$ | 236031 | $\frac{1}{4}$ | 247    | $\frac{1}{4}$ | 355    | $\frac{1}{4}$ | 366    | $\frac{1}{4}$ | 287    | $\frac{1}{4}$ | 127    |
| $\frac{1}{2}$ | 078    | $\frac{1}{2}$ | 292    | $\frac{1}{2}$ | 398    | $\frac{1}{2}$ | 406    | $\frac{1}{2}$ | 326    | $\frac{1}{2}$ | 165    |
| $\frac{3}{4}$ | 126    | $\frac{3}{4}$ | 337    | $\frac{3}{4}$ | 441    | $\frac{3}{4}$ | 447    | $\frac{3}{4}$ | 365    | $\frac{3}{4}$ | 202    |
| 230           | 173    | 242           | 382    | 254           | 483    | 266           | 488    | 278           | 404    | 290           | 240    |
| $\frac{1}{4}$ | 220    | $\frac{1}{4}$ | 426    | $\frac{1}{4}$ | 526    | $\frac{1}{4}$ | 529    | $\frac{1}{4}$ | 444    | $\frac{1}{2}$ | 315    |
| $\frac{1}{2}$ | 267    | $\frac{1}{2}$ | 471    | $\frac{1}{2}$ | 569    | $\frac{1}{2}$ | 570    | $\frac{1}{2}$ | 483    | 291           | 389    |
| $\frac{3}{4}$ | 314    | $\frac{3}{4}$ | 516    | $\frac{3}{4}$ | 611    | $\frac{3}{4}$ | 610    | $\frac{3}{4}$ | 521    | $\frac{1}{2}$ | 464    |
| 231           | 361    | 243           | 561    | 255           | 654    | 267           | 651    | 279           | 560    | 292           | 538    |
| $\frac{1}{4}$ | 408    | $\frac{1}{4}$ | 605    | $\frac{1}{4}$ | 697    | $\frac{1}{4}$ | 692    | $\frac{1}{4}$ | 599    | $\frac{1}{2}$ | 613    |
| $\frac{1}{2}$ | 455    | $\frac{1}{2}$ | 650    | $\frac{1}{2}$ | 739    | $\frac{1}{2}$ | 732    | $\frac{1}{2}$ | 638    | 293           | 687    |
| $\frac{3}{4}$ | 502    | $\frac{3}{4}$ | 694    | $\frac{3}{4}$ | 782    | $\frac{3}{4}$ | 773    | $\frac{3}{4}$ | 677    | $\frac{1}{2}$ | 761    |
| 232           | 549    | 244           | 739    | 256           | 824    | 268           | 813    | 280           | 716    | 294           | 835    |
| $\frac{1}{4}$ | 596    | $\frac{1}{4}$ | 783    | $\frac{1}{4}$ | 866    | $\frac{1}{4}$ | 854    | $\frac{1}{4}$ | 755    | $\frac{1}{2}$ | 909    |
| $\frac{1}{2}$ | 642    | $\frac{1}{2}$ | 828    | $\frac{1}{2}$ | 909    | $\frac{1}{2}$ | 894    | $\frac{1}{2}$ | 793    | 295           | 982    |
| $\frac{3}{4}$ | 689    | $\frac{3}{4}$ | 872    | $\frac{3}{4}$ | 951    | $\frac{3}{4}$ | 935    | $\frac{3}{4}$ | 832    | $\frac{1}{2}$ | 247056 |
| 233           | 736    | 245           | 917    | 257           | 993    | 269           | 975    | 281           | 871    | 296           | 129    |
| $\frac{1}{4}$ | 782    | $\frac{1}{4}$ | 961    | $\frac{1}{4}$ | 241036 | $\frac{1}{4}$ | 243016 | $\frac{1}{4}$ | 909    | $\frac{1}{2}$ | 202    |
| $\frac{1}{2}$ | 829    | $\frac{1}{2}$ | 239005 | $\frac{1}{2}$ | 078    | $\frac{1}{2}$ | 056    | $\frac{1}{2}$ | 948    | 297           | 276    |
| $\frac{3}{4}$ | 875    | $\frac{3}{4}$ | 049    | $\frac{3}{4}$ | 120    | $\frac{3}{4}$ | 096    | $\frac{3}{4}$ | 986    | $\frac{1}{2}$ | 349    |
| 234           | 922    | 246           | 094    | 258           | 162    | 270           | 136    | 282           | 245025 | 298           | 422    |
| $\frac{1}{4}$ | 968    | $\frac{1}{4}$ | 138    | $\frac{1}{4}$ | 204    | $\frac{1}{4}$ | 177    | $\frac{1}{4}$ | 063    | $\frac{1}{2}$ | 494    |
| $\frac{1}{2}$ | 237014 | $\frac{1}{2}$ | 182    | $\frac{1}{2}$ | 246    | $\frac{1}{2}$ | 217    | $\frac{1}{2}$ | 102    | 299           | 567    |
| $\frac{3}{4}$ | 061    | $\frac{3}{4}$ | 226    | $\frac{3}{4}$ | 288    | $\frac{3}{4}$ | 257    | $\frac{3}{4}$ | 140    | $\frac{1}{2}$ | 640    |



| 300 |        |     |        | 400 |        |     |        | 500 |        |     |        |
|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|
| Nu. | Log.   | Nu. | Log.   | Nu. | Log.   | Nu. | Log.   | Nu. | Log.   | Nu. | Log.   |
| 0   | 247712 | 50  | 254407 | 0   | 260206 | 50  | 265321 | 0   | 269897 | 50  | 274036 |
| 1   | 857    | 51  | 531    | 1   | 314    | 51  | 418    | 1   | 984    | 51  | 115    |
| 2   | 248001 | 52  | 654    | 2   | 423    | 52  | 514    | 2   | 270070 | 52  | 194    |
| 3   | 144    | 53  | 777    | 3   | 531    | 53  | 610    | 3   | 157    | 53  | 273    |
| 4   | 287    | 54  | 900    | 4   | 638    | 54  | 706    | 4   | 243    | 54  | 351    |
| 5   | 430    | 55  | 255023 | 5   | 746    | 55  | 801    | 5   | 329    | 55  | 429    |
| 6   | 572    | 56  | 145    | 6   | 853    | 56  | 896    | 6   | 415    | 56  | 507    |
| 7   | 714    | 57  | 267    | 7   | 959    | 57  | 992    | 7   | 501    | 57  | 586    |
| 8   | 855    | 58  | 388    | 8   | 261066 | 58  | 266087 | 8   | 586    | 58  | 663    |
| 9   | 996    | 59  | 509    | 9   | 172    | 59  | 181    | 9   | 672    | 59  | 741    |
| 10  | 249136 | 60  | 630    | 10  | 278    | 60  | 276    | 10  | 757    | 60  | 819    |
| 11  | 276    | 61  | 751    | 11  | 384    | 61  | 370    | 11  | 842    | 61  | 896    |
| 12  | 415    | 62  | 871    | 12  | 490    | 62  | 464    | 12  | 927    | 62  | 974    |
| 13  | 554    | 63  | 991    | 13  | 595    | 63  | 558    | 13  | 271012 | 63  | 275051 |
| 14  | 693    | 64  | 256110 | 14  | 700    | 64  | 652    | 14  | 096    | 64  | 128    |
| 15  | 831    | 65  | 229    | 15  | 805    | 65  | 745    | 15  | 181    | 65  | 205    |
| 16  | 969    | 66  | 348    | 16  | 909    | 66  | 839    | 16  | 265    | 66  | 282    |
| 17  | 250106 | 67  | 467    | 17  | 262014 | 67  | 932    | 17  | 349    | 67  | 358    |
| 18  | 243    | 68  | 585    | 18  | 118    | 68  | 267025 | 18  | 433    | 68  | 435    |
| 19  | 379    | 69  | 703    | 19  | 221    | 69  | 117    | 19  | 517    | 69  | 511    |
| 20  | 515    | 70  | 820    | 20  | 325    | 70  | 210    | 20  | 600    | 70  | 587    |
| 21  | 651    | 71  | 937    | 21  | 428    | 71  | 302    | 21  | 684    | 71  | 664    |
| 22  | 786    | 72  | 257054 | 22  | 531    | 72  | 394    | 22  | 767    | 72  | 740    |
| 23  | 920    | 73  | 171    | 23  | 634    | 73  | 486    | 23  | 850    | 73  | 815    |
| 24  | 251055 | 74  | 287    | 24  | 737    | 74  | 578    | 24  | 933    | 74  | 891    |
| 25  | 188    | 75  | 403    | 25  | 839    | 75  | 669    | 25  | 272016 | 75  | 967    |
| 26  | 322    | 76  | 519    | 26  | 941    | 76  | 761    | 26  | 099    | 76  | 276042 |
| 27  | 455    | 77  | 634    | 27  | 263043 | 77  | 852    | 27  | 181    | 77  | 118    |
| 28  | 587    | 78  | 749    | 28  | 144    | 78  | 943    | 28  | 263    | 78  | 193    |
| 29  | 720    | 79  | 864    | 29  | 246    | 79  | 268034 | 29  | 346    | 79  | 268    |
| 30  | 851    | 80  | 978    | 30  | 347    | 80  | 124    | 30  | 428    | 80  | 343    |
| 31  | 983    | 81  | 258092 | 31  | 448    | 81  | 215    | 31  | 509    | 81  | 418    |
| 32  | 252114 | 82  | 206    | 32  | 548    | 82  | 305    | 32  | 591    | 82  | 492    |
| 33  | 244    | 83  | 320    | 33  | 649    | 83  | 395    | 33  | 673    | 83  | 567    |
| 34  | 375    | 84  | 433    | 34  | 749    | 84  | 485    | 34  | 754    | 84  | 641    |
| 35  | 504    | 85  | 546    | 35  | 849    | 85  | 574    | 35  | 835    | 85  | 716    |
| 36  | 634    | 86  | 659    | 36  | 949    | 86  | 664    | 36  | 916    | 86  | 790    |
| 37  | 763    | 87  | 771    | 37  | 264048 | 87  | 753    | 37  | 997    | 87  | 864    |
| 38  | 892    | 88  | 883    | 38  | 147    | 88  | 842    | 38  | 273078 | 88  | 938    |
| 39  | 253020 | 89  | 995    | 39  | 246    | 89  | 931    | 39  | 159    | 89  | 277012 |
| 40  | 148    | 90  | 259106 | 40  | 345    | 90  | 269020 | 40  | 239    | 90  | 085    |
| 41  | 275    | 91  | 218    | 41  | 444    | 91  | 108    | 41  | 320    | 91  | 159    |
| 42  | 403    | 92  | 329    | 42  | 542    | 92  | 197    | 42  | 400    | 92  | 232    |
| 43  | 529    | 93  | 439    | 43  | 640    | 93  | 285    | 43  | 480    | 93  | 305    |
| 44  | 656    | 94  | 550    | 44  | 738    | 94  | 373    | 44  | 560    | 94  | 379    |
| 45  | 782    | 95  | 660    | 45  | 836    | 95  | 461    | 45  | 640    | 95  | 452    |
| 46  | 908    | 96  | 770    | 46  | 933    | 96  | 548    | 46  | 719    | 96  | 525    |
| 47  | 254033 | 97  | 879    | 47  | 265031 | 97  | 636    | 47  | 799    | 97  | 597    |
| 48  | 158    | 98  | 988    | 48  | 128    | 98  | 723    | 48  | 878    | 98  | 670    |
| 49  | 283    | 99  | 260097 | 49  | 225    | 99  | 810    | 49  | 957    | 99  | 743    |



| 600 |        |     |        | 700 |        |     |        | 800 |        |     |        |
|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|
| Nu. | Log.   | Nu. | Log.   | Nu. | Log.   | Nu. | Log.   | Nu. | Log.   | Nu. | Log.   |
| 0   | 277815 | 50  | 281291 | 0   | 284510 | 50  | 287506 | 0   | 290309 | 50  | 292942 |
| 1   | 887    | 51  | 358    | 1   | 572    | 51  | 564    | 1   | 363    | 51  | 993    |
| 2   | 960    | 52  | 425    | 2   | 634    | 52  | 622    | 2   | 417    | 52  | 293044 |
| 3   | 278032 | 53  | 491    | 3   | 696    | 53  | 679    | 3   | 472    | 53  | 095    |
| 4   | 104    | 54  | 558    | 4   | 757    | 54  | 737    | 4   | 526    | 54  | 146    |
| 5   | 176    | 55  | 624    | 5   | 819    | 55  | 795    | 5   | 580    | 55  | 197    |
| 6   | 247    | 56  | 690    | 6   | 880    | 56  | 852    | 6   | 634    | 56  | 247    |
| 7   | 319    | 57  | 757    | 7   | 942    | 57  | 910    | 7   | 687    | 57  | 298    |
| 8   | 390    | 58  | 823    | 8   | 285003 | 58  | 967    | 8   | 741    | 58  | 349    |
| 9   | 462    | 59  | 889    | 9   | 065    | 59  | 288024 | 9   | 795    | 59  | 399    |
| 10  | 533    | 60  | 954    | 10  | 126    | 60  | 081    | 10  | 849    | 60  | 450    |
| 11  | 604    | 61  | 282020 | 11  | 187    | 61  | 138    | 11  | 902    | 61  | 500    |
| 12  | 675    | 62  | 086    | 12  | 248    | 62  | 195    | 12  | 956    | 62  | 551    |
| 13  | 746    | 63  | 151    | 13  | 309    | 63  | 252    | 13  | 291009 | 63  | 601    |
| 14  | 817    | 64  | 217    | 14  | 370    | 64  | 309    | 14  | 062    | 64  | 651    |
| 15  | 888    | 65  | 282    | 15  | 431    | 65  | 366    | 15  | 116    | 65  | 702    |
| 16  | 958    | 66  | 347    | 16  | 491    | 66  | 423    | 16  | 169    | 66  | 752    |
| 17  | 279029 | 67  | 413    | 17  | 552    | 67  | 480    | 17  | 222    | 67  | 802    |
| 18  | 099    | 68  | 478    | 18  | 612    | 68  | 536    | 18  | 275    | 68  | 852    |
| 19  | 169    | 69  | 543    | 19  | 673    | 69  | 593    | 19  | 328    | 69  | 902    |
| 20  | 239    | 70  | 607    | 20  | 733    | 70  | 649    | 20  | 381    | 70  | 952    |
| 21  | 309    | 71  | 672    | 21  | 794    | 71  | 705    | 21  | 434    | 71  | 294002 |
| 22  | 379    | 72  | 737    | 22  | 854    | 72  | 762    | 22  | 487    | 72  | 052    |
| 23  | 449    | 73  | 802    | 23  | 914    | 73  | 818    | 23  | 540    | 73  | 101    |
| 24  | 518    | 74  | 866    | 24  | 974    | 74  | 874    | 24  | 593    | 74  | 151    |
| 25  | 588    | 75  | 930    | 25  | 286034 | 75  | 930    | 25  | 645    | 75  | 201    |
| 26  | 657    | 76  | 995    | 26  | 094    | 76  | 986    | 26  | 698    | 76  | 250    |
| 27  | 727    | 77  | 283059 | 27  | 153    | 77  | 289042 | 27  | 751    | 77  | 300    |
| 28  | 796    | 78  | 123    | 28  | 213    | 78  | 098    | 28  | 803    | 78  | 349    |
| 29  | 865    | 79  | 187    | 29  | 273    | 79  | 154    | 29  | 855    | 79  | 399    |
| 30  | 934    | 80  | 251    | 30  | 332    | 80  | 209    | 30  | 908    | 80  | 448    |
| 31  | 280003 | 81  | 315    | 31  | 392    | 81  | 265    | 31  | 960    | 81  | 498    |
| 32  | 072    | 82  | 378    | 32  | 451    | 82  | 321    | 32  | 292012 | 82  | 547    |
| 33  | 140    | 83  | 442    | 33  | 510    | 83  | 376    | 33  | 064    | 83  | 596    |
| 34  | 209    | 84  | 506    | 34  | 570    | 84  | 432    | 34  | 117    | 84  | 645    |
| 35  | 277    | 85  | 569    | 35  | 629    | 85  | 487    | 35  | 169    | 85  | 694    |
| 36  | 346    | 86  | 632    | 36  | 688    | 86  | 542    | 36  | 221    | 86  | 743    |
| 37  | 414    | 87  | 696    | 37  | 747    | 87  | 597    | 37  | 273    | 87  | 792    |
| 38  | 482    | 88  | 759    | 38  | 806    | 88  | 653    | 38  | 324    | 88  | 841    |
| 39  | 550    | 89  | 822    | 39  | 864    | 89  | 708    | 39  | 376    | 89  | 890    |
| 40  | 618    | 90  | 885    | 40  | 923    | 90  | 763    | 40  | 428    | 90  | 939    |
| 41  | 686    | 91  | 948    | 41  | 982    | 91  | 818    | 41  | 480    | 91  | 988    |
| 42  | 754    | 92  | 284011 | 42  | 287040 | 92  | 873    | 42  | 531    | 92  | 295036 |
| 43  | 821    | 93  | 073    | 43  | 099    | 93  | 927    | 43  | 583    | 93  | 085    |
| 44  | 889    | 94  | 136    | 44  | 157    | 94  | 982    | 44  | 634    | 94  | 134    |
| 45  | 956    | 95  | 198    | 45  | 216    | 95  | 290037 | 45  | 686    | 95  | 182    |
| 46  | 281023 | 96  | 261    | 46  | 274    | 96  | 091    | 46  | 737    | 96  | 231    |
| 47  | 090    | 97  | 323    | 47  | 332    | 97  | 146    | 47  | 788    | 97  | 279    |
| 48  | 158    | 98  | 386    | 48  | 390    | 98  | 200    | 48  | 840    | 98  | 328    |
| 49  | 224    | 99  | 448    | 49  | 448    | 99  | 255    | 49  | 891    | 99  | 376    |



| 900 |        |     |        | 1000 |        |     |        | 1100 |        |     |        |
|-----|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu. | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0   | 295424 | 50  | 297772 | 0    | 300000 | 50  | 302119 | 0    | 304139 | 50  | 306070 |
| 1   | 472    | 51  | 818    | 1    | 043    | 51  | 160    | 1    | 179    | 51  | 108    |
| 2   | 521    | 52  | 864    | 2    | 087    | 52  | 202    | 2    | 218    | 52  | 145    |
| 3   | 569    | 53  | 909    | 3    | 130    | 53  | 243    | 3    | 258    | 53  | 183    |
| 4   | 617    | 54  | 955    | 4    | 173    | 54  | 284    | 4    | 297    | 54  | 221    |
| 5   | 665    | 55  | 298000 | 5    | 217    | 55  | 325    | 5    | 336    | 55  | 258    |
| 6   | 713    | 56  | 046    | 6    | 260    | 56  | 366    | 6    | 376    | 56  | 296    |
| 7   | 761    | 57  | 091    | 7    | 303    | 57  | 408    | 7    | 415    | 57  | 333    |
| 8   | 809    | 58  | 137    | 8    | 346    | 58  | 449    | 8    | 454    | 58  | 371    |
| 9   | 856    | 59  | 182    | 9    | 389    | 59  | 490    | 9    | 493    | 59  | 408    |
| 10  | 904    | 60  | 227    | 10   | 432    | 60  | 531    | 10   | 532    | 60  | 446    |
| 11  | 952    | 61  | 272    | 11   | 475    | 61  | 572    | 11   | 571    | 61  | 483    |
| 12  | 999    | 62  | 318    | 12   | 518    | 62  | 612    | 12   | 610    | 62  | 521    |
| 13  | 296047 | 63  | 363    | 13   | 561    | 63  | 653    | 13   | 650    | 63  | 558    |
| 14  | 095    | 64  | 408    | 14   | 604    | 64  | 694    | 14   | 689    | 64  | 595    |
| 15  | 142    | 65  | 453    | 15   | 647    | 65  | 735    | 15   | 727    | 65  | 633    |
| 16  | 190    | 66  | 498    | 16   | 689    | 66  | 776    | 16   | 766    | 66  | 670    |
| 17  | 237    | 67  | 543    | 17   | 732    | 67  | 816    | 17   | 805    | 67  | 707    |
| 18  | 284    | 68  | 588    | 18   | 775    | 68  | 857    | 18   | 844    | 68  | 744    |
| 19  | 332    | 69  | 632    | 19   | 817    | 69  | 898    | 19   | 883    | 69  | 781    |
| 20  | 379    | 70  | 677    | 20   | 860    | 70  | 938    | 20   | 922    | 70  | 819    |
| 21  | 426    | 71  | 722    | 21   | 903    | 71  | 979    | 21   | 961    | 71  | 856    |
| 22  | 473    | 72  | 767    | 22   | 945    | 72  | 303019 | 22   | 999    | 72  | 893    |
| 23  | 520    | 73  | 811    | 23   | 988    | 73  | 060    | 23   | 305038 | 73  | 930    |
| 24  | 567    | 74  | 856    | 24   | 301030 | 74  | 100    | 24   | 077    | 74  | 967    |
| 25  | 614    | 75  | 900    | 25   | 072    | 75  | 141    | 25   | 115    | 75  | 307004 |
| 26  | 661    | 76  | 945    | 26   | 115    | 76  | 181    | 26   | 154    | 76  | 041    |
| 27  | 708    | 77  | 989    | 27   | 157    | 77  | 222    | 27   | 192    | 77  | 078    |
| 28  | 755    | 78  | 299034 | 28   | 199    | 78  | 262    | 28   | 231    | 78  | 115    |
| 29  | 802    | 79  | 078    | 29   | 242    | 79  | 302    | 29   | 269    | 79  | 151    |
| 30  | 848    | 80  | 123    | 30   | 284    | 80  | 342    | 30   | 308    | 80  | 188    |
| 31  | 895    | 81  | 167    | 31   | 326    | 81  | 383    | 31   | 346    | 81  | 225    |
| 32  | 942    | 82  | 211    | 32   | 368    | 82  | 423    | 32   | 385    | 82  | 262    |
| 33  | 988    | 83  | 255    | 33   | 410    | 83  | 463    | 33   | 423    | 83  | 298    |
| 34  | 297035 | 84  | 300    | 34   | 452    | 84  | 503    | 34   | 461    | 84  | 335    |
| 35  | 081    | 85  | 344    | 35   | 494    | 85  | 543    | 35   | 500    | 85  | 372    |
| 36  | 128    | 86  | 388    | 36   | 536    | 86  | 583    | 36   | 538    | 86  | 408    |
| 37  | 174    | 87  | 432    | 37   | 578    | 87  | 623    | 37   | 576    | 87  | 445    |
| 38  | 220    | 88  | 476    | 38   | 620    | 88  | 663    | 38   | 614    | 88  | 482    |
| 39  | 267    | 89  | 520    | 39   | 662    | 89  | 703    | 39   | 652    | 89  | 518    |
| 40  | 313    | 90  | 564    | 40   | 703    | 90  | 743    | 40   | 690    | 90  | 555    |
| 41  | 359    | 91  | 607    | 41   | 746    | 91  | 782    | 41   | 729    | 91  | 591    |
| 42  | 405    | 92  | 651    | 42   | 787    | 92  | 822    | 42   | 767    | 92  | 628    |
| 43  | 451    | 93  | 695    | 43   | 828    | 93  | 862    | 43   | 805    | 93  | 664    |
| 44  | 497    | 94  | 739    | 44   | 870    | 94  | 902    | 44   | 843    | 94  | 700    |
| 45  | 543    | 95  | 782    | 45   | 912    | 95  | 941    | 45   | 881    | 95  | 737    |
| 46  | 589    | 96  | 826    | 46   | 953    | 96  | 981    | 46   | 918    | 96  | 773    |
| 47  | 635    | 97  | 870    | 47   | 995    | 97  | 304021 | 47   | 956    | 97  | 809    |
| 48  | 681    | 98  | 913    | 48   | 302036 | 98  | 060    | 48   | 994    | 98  | 846    |
| 49  | 727    | 99  | 957    | 49   | 078    | 99  | 100    | 49   | 306032 | 99  | 882    |



| 1200 |        |     |        | 1300 |        |     |        | 1400 |        |     |        |
|------|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0    | 307918 | 50  | 309691 | 0    | 311394 | 50  | 313033 | 0    | 314613 | 50  | 316137 |
| 1    | 954    | 51  | 726    | 1    | 428    | 51  | 066    | 1    | 644    | 51  | 167    |
| 2    | 990    | 52  | 760    | 2    | 461    | 52  | 098    | 2    | 675    | 52  | 197    |
| 3    | 308027 | 53  | 795    | 3    | 494    | 53  | 130    | 3    | 706    | 53  | 227    |
| 4    | 063    | 54  | 830    | 4    | 528    | 54  | 162    | 4    | 737    | 54  | 256    |
| 5    | 099    | 55  | 864    | 5    | 561    | 55  | 194    | 5    | 768    | 55  | 286    |
| 6    | 135    | 56  | 899    | 6    | 594    | 56  | 226    | 6    | 799    | 56  | 316    |
| 7    | 171    | 57  | 934    | 7    | 628    | 57  | 258    | 7    | 829    | 57  | 346    |
| 8    | 207    | 58  | 968    | 8    | 661    | 58  | 290    | 8    | 860    | 58  | 376    |
| 9    | 243    | 59  | 310003 | 9    | 694    | 59  | 322    | 9    | 891    | 59  | 406    |
| 10   | 279    | 60  | 037    | 10   | 727    | 60  | 354    | 10   | 922    | 60  | 435    |
| 11   | 314    | 61  | 072    | 11   | 760    | 61  | 386    | 11   | 953    | 61  | 465    |
| 12   | 350    | 62  | 106    | 12   | 793    | 62  | 418    | 12   | 983    | 62  | 495    |
| 13   | 386    | 63  | 140    | 13   | 826    | 63  | 450    | 13   | 315014 | 63  | 524    |
| 14   | 422    | 64  | 175    | 14   | 860    | 64  | 481    | 14   | 045    | 64  | 554    |
| 15   | 457    | 65  | 209    | 15   | 893    | 65  | 513    | 15   | 076    | 65  | 584    |
| 16   | 493    | 66  | 243    | 16   | 926    | 66  | 545    | 16   | 106    | 66  | 613    |
| 17   | 529    | 67  | 278    | 17   | 959    | 67  | 577    | 17   | 137    | 67  | 643    |
| 18   | 565    | 68  | 312    | 18   | 992    | 68  | 609    | 18   | 168    | 68  | 673    |
| 19   | 600    | 69  | 346    | 19   | 312024 | 69  | 640    | 19   | 198    | 69  | 702    |
| 20   | 636    | 70  | 380    | 20   | 057    | 70  | 672    | 20   | 229    | 70  | 732    |
| 21   | 672    | 71  | 415    | 21   | 090    | 71  | 704    | 21   | 259    | 71  | 761    |
| 22   | 707    | 72  | 449    | 22   | 123    | 72  | 735    | 22   | 290    | 72  | 791    |
| 23   | 743    | 73  | 483    | 23   | 156    | 73  | 767    | 23   | 320    | 73  | 820    |
| 24   | 778    | 74  | 517    | 24   | 189    | 74  | 799    | 24   | 351    | 74  | 850    |
| 25   | 814    | 75  | 551    | 25   | 222    | 75  | 830    | 25   | 381    | 75  | 879    |
| 26   | 849    | 76  | 585    | 26   | 254    | 76  | 862    | 26   | 412    | 76  | 909    |
| 27   | 884    | 77  | 619    | 27   | 287    | 77  | 893    | 27   | 442    | 77  | 938    |
| 28   | 920    | 78  | 653    | 28   | 320    | 78  | 925    | 28   | 473    | 78  | 967    |
| 29   | 955    | 79  | 687    | 29   | 352    | 79  | 956    | 29   | 503    | 79  | 997    |
| 30   | 991    | 80  | 721    | 30   | 385    | 80  | 988    | 30   | 534    | 80  | 317026 |
| 31   | 309026 | 81  | 755    | 31   | 418    | 81  | 314019 | 31   | 564    | 81  | 056    |
| 32   | 061    | 82  | 789    | 32   | 450    | 82  | 051    | 32   | 594    | 82  | 085    |
| 33   | 096    | 83  | 823    | 33   | 483    | 83  | 082    | 33   | 625    | 83  | 114    |
| 34   | 132    | 84  | 856    | 34   | 516    | 84  | 114    | 34   | 655    | 84  | 143    |
| 35   | 167    | 85  | 890    | 35   | 548    | 85  | 145    | 35   | 685    | 85  | 173    |
| 36   | 202    | 86  | 924    | 36   | 581    | 86  | 176    | 36   | 715    | 86  | 202    |
| 37   | 237    | 87  | 958    | 37   | 613    | 87  | 208    | 37   | 746    | 87  | 231    |
| 38   | 272    | 88  | 992    | 38   | 646    | 88  | 239    | 38   | 776    | 88  | 260    |
| 39   | 307    | 89  | 311025 | 39   | 678    | 89  | 270    | 39   | 806    | 89  | 289    |
| 40   | 342    | 90  | 059    | 40   | 710    | 90  | 301    | 40   | 836    | 90  | 319    |
| 41   | 377    | 91  | 093    | 41   | 743    | 91  | 333    | 41   | 866    | 91  | 348    |
| 42   | 412    | 92  | 126    | 42   | 775    | 92  | 364    | 42   | 897    | 92  | 377    |
| 43   | 447    | 93  | 160    | 43   | 808    | 93  | 395    | 43   | 927    | 93  | 406    |
| 44   | 482    | 94  | 193    | 44   | 840    | 94  | 426    | 44   | 957    | 94  | 435    |
| 45   | 517    | 95  | 227    | 45   | 872    | 95  | 457    | 45   | 987    | 95  | 464    |
| 46   | 552    | 96  | 260    | 46   | 905    | 96  | 489    | 46   | 316017 | 96  | 493    |
| 47   | 587    | 97  | 294    | 47   | 937    | 97  | 520    | 47   | 047    | 97  | 522    |
| 48   | 621    | 98  | 327    | 48   | 969    | 98  | 551    | 48   | 077    | 98  | 551    |
| 49   | 656    | 99  | 361    | 49   | 313001 | 99  | 582    | 49   | 107    | 99  | 580    |



| 1500 |        |     |        | 1600 |        |     |        | 1700 |        |     |        |
|------|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0    | 317609 | 50  | 319033 | 0    | 320412 | 50  | 321748 | 0    | 323045 | 50  | 324304 |
| 1    | 638    | 51  | 061    | 1    | 439    | 51  | 775    | 1    | 070    | 51  | 329    |
| 2    | 667    | 52  | 089    | 2    | 466    | 52  | 801    | 2    | 096    | 52  | 353    |
| 3    | 696    | 53  | 117    | 3    | 493    | 53  | 827    | 3    | 121    | 53  | 378    |
| 4    | 725    | 54  | 145    | 4    | 520    | 54  | 854    | 4    | 147    | 54  | 403    |
| 5    | 754    | 55  | 173    | 5    | 547    | 55  | 880    | 5    | 172    | 55  | 428    |
| 6    | 782    | 56  | 201    | 6    | 575    | 56  | 906    | 6    | 198    | 56  | 453    |
| 7    | 811    | 57  | 229    | 7    | 602    | 57  | 932    | 7    | 223    | 57  | 477    |
| 8    | 840    | 58  | 257    | 8    | 629    | 58  | 958    | 8    | 249    | 58  | 502    |
| 9    | 869    | 59  | 285    | 9    | 656    | 59  | 985    | 9    | 274    | 59  | 527    |
| 10   | 898    | 60  | 312    | 10   | 683    | 60  | 322011 | 10   | 300    | 60  | 551    |
| 11   | 926    | 61  | 340    | 11   | 710    | 61  | 037    | 11   | 325    | 61  | 576    |
| 12   | 955    | 62  | 368    | 12   | 736    | 62  | 063    | 12   | 350    | 62  | 601    |
| 13   | 984    | 63  | 396    | 13   | 763    | 63  | 089    | 13   | 376    | 63  | 625    |
| 14   | 318013 | 64  | 424    | 14   | 790    | 64  | 115    | 14   | 401    | 64  | 650    |
| 15   | 041    | 65  | 451    | 15   | 817    | 65  | 141    | 15   | 426    | 65  | 674    |
| 16   | 070    | 66  | 479    | 16   | 844    | 66  | 167    | 16   | 452    | 66  | 699    |
| 17   | 099    | 67  | 507    | 17   | 871    | 67  | 194    | 17   | 477    | 67  | 724    |
| 18   | 127    | 68  | 535    | 18   | 898    | 68  | 220    | 18   | 502    | 68  | 748    |
| 19   | 156    | 69  | 562    | 19   | 925    | 69  | 246    | 19   | 528    | 69  | 773    |
| 20   | 184    | 70  | 590    | 20   | 952    | 70  | 272    | 20   | 553    | 70  | 797    |
| 21   | 213    | 71  | 618    | 21   | 978    | 71  | 298    | 21   | 578    | 71  | 822    |
| 22   | 241    | 72  | 645    | 22   | 321005 | 72  | 324    | 22   | 603    | 72  | 846    |
| 23   | 270    | 73  | 673    | 23   | 032    | 73  | 350    | 23   | 629    | 73  | 871    |
| 24   | 298    | 74  | 700    | 24   | 059    | 74  | 376    | 24   | 654    | 74  | 895    |
| 25   | 327    | 75  | 728    | 25   | 085    | 75  | 401    | 25   | 679    | 75  | 920    |
| 26   | 355    | 76  | 756    | 26   | 112    | 76  | 427    | 26   | 704    | 76  | 944    |
| 27   | 384    | 77  | 783    | 27   | 139    | 77  | 453    | 27   | 729    | 77  | 969    |
| 28   | 412    | 78  | 811    | 28   | 165    | 78  | 479    | 28   | 754    | 78  | 993    |
| 29   | 441    | 79  | 838    | 29   | 192    | 79  | 505    | 29   | 779    | 79  | 325018 |
| 30   | 469    | 80  | 866    | 30   | 219    | 80  | 531    | 30   | 805    | 80  | 042    |
| 31   | 498    | 81  | 893    | 31   | 245    | 81  | 557    | 31   | 830    | 81  | 066    |
| 32   | 526    | 82  | 921    | 32   | 272    | 82  | 583    | 32   | 855    | 82  | 091    |
| 33   | 554    | 83  | 948    | 33   | 299    | 83  | 608    | 33   | 880    | 83  | 115    |
| 34   | 583    | 84  | 976    | 34   | 325    | 84  | 634    | 34   | 905    | 84  | 139    |
| 35   | 611    | 85  | 320003 | 35   | 352    | 85  | 660    | 35   | 930    | 85  | 164    |
| 36   | 639    | 86  | 030    | 36   | 378    | 86  | 686    | 36   | 955    | 86  | 188    |
| 37   | 667    | 87  | 058    | 37   | 405    | 87  | 712    | 37   | 980    | 87  | 212    |
| 38   | 696    | 88  | 085    | 38   | 431    | 88  | 737    | 38   | 324005 | 88  | 237    |
| 39   | 724    | 89  | 112    | 39   | 458    | 89  | 763    | 39   | 030    | 89  | 261    |
| 40   | 752    | 90  | 140    | 40   | 484    | 90  | 789    | 40   | 055    | 90  | 285    |
| 41   | 780    | 91  | 167    | 41   | 511    | 91  | 814    | 41   | 080    | 91  | 310    |
| 42   | 808    | 92  | 194    | 42   | 537    | 92  | 840    | 42   | 105    | 92  | 334    |
| 43   | 837    | 93  | 222    | 43   | 564    | 93  | 866    | 43   | 130    | 93  | 358    |
| 44   | 865    | 94  | 249    | 44   | 590    | 94  | 891    | 44   | 155    | 94  | 382    |
| 45   | 893    | 95  | 276    | 45   | 617    | 95  | 917    | 45   | 180    | 95  | 406    |
| 46   | 921    | 96  | 303    | 46   | 643    | 96  | 943    | 46   | 204    | 96  | 431    |
| 47   | 949    | 97  | 330    | 47   | 669    | 97  | 968    | 47   | 229    | 97  | 455    |
| 48   | 977    | 98  | 358    | 48   | 696    | 98  | 994    | 48   | 254    | 98  | 479    |
| 49   | 319005 | 99  | 385    | 49   | 722    | 99  | 323019 | 49   | 279    | 99  | 503    |



| 1800 |        |     |        | 1900 |        |     |        | 2000 |        |     |        |
|------|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0    | 325527 | 50  | 326717 | 0    | 327875 | 50  | 329003 | 0    | 330103 | 50  | 331175 |
| 1    | 551    | 51  | 741    | 1    | 898    | 51  | 026    | 1    | 125    | 51  | 197    |
| 2    | 575    | 52  | 764    | 2    | 921    | 52  | 048    | 2    | 146    | 52  | 218    |
| 3    | 600    | 53  | 788    | 3    | 944    | 53  | 070    | 3    | 168    | 53  | 239    |
| 4    | 624    | 54  | 811    | 4    | 967    | 54  | 092    | 4    | 190    | 54  | 260    |
| 5    | 648    | 55  | 834    | 5    | 989    | 55  | 115    | 5    | 211    | 55  | 281    |
| 6    | 672    | 56  | 858    | 6    | 328012 | 56  | 137    | 6    | 233    | 56  | 302    |
| 7    | 696    | 57  | 881    | 7    | 035    | 57  | 159    | 7    | 255    | 57  | 323    |
| 8    | 720    | 58  | 905    | 8    | 058    | 58  | 181    | 8    | 276    | 58  | 345    |
| 9    | 744    | 59  | 928    | 9    | 081    | 59  | 203    | 9    | 298    | 59  | 366    |
| 10   | 768    | 60  | 951    | 10   | 103    | 60  | 226    | 10   | 320    | 60  | 387    |
| 11   | 792    | 61  | 975    | 11   | 126    | 61  | 248    | 11   | 341    | 61  | 408    |
| 12   | 816    | 62  | 998    | 12   | 149    | 62  | 270    | 12   | 363    | 62  | 429    |
| 13   | 840    | 63  | 327021 | 13   | 171    | 63  | 292    | 13   | 384    | 63  | 450    |
| 14   | 864    | 64  | 045    | 14   | 194    | 64  | 314    | 14   | 406    | 64  | 471    |
| 15   | 888    | 65  | 068    | 15   | 217    | 65  | 336    | 15   | 428    | 65  | 492    |
| 16   | 912    | 66  | 091    | 16   | 240    | 66  | 358    | 16   | 449    | 66  | 513    |
| 17   | 935    | 67  | 114    | 17   | 262    | 67  | 380    | 17   | 471    | 67  | 534    |
| 18   | 959    | 68  | 138    | 18   | 285    | 68  | 403    | 18   | 492    | 68  | 555    |
| 19   | 983    | 69  | 161    | 19   | 307    | 69  | 425    | 19   | 514    | 69  | 576    |
| 20   | 326007 | 70  | 184    | 20   | 330    | 70  | 447    | 20   | 535    | 70  | 597    |
| 21   | 031    | 71  | 207    | 21   | 353    | 71  | 469    | 21   | 557    | 71  | 618    |
| 22   | 055    | 72  | 231    | 22   | 375    | 72  | 491    | 22   | 578    | 72  | 639    |
| 23   | 079    | 73  | 254    | 23   | 398    | 73  | 513    | 23   | 600    | 73  | 660    |
| 24   | 102    | 74  | 277    | 24   | 421    | 74  | 535    | 24   | 621    | 74  | 681    |
| 25   | 126    | 75  | 300    | 25   | 443    | 75  | 557    | 25   | 642    | 75  | 702    |
| 26   | 150    | 76  | 323    | 26   | 466    | 76  | 579    | 26   | 664    | 76  | 723    |
| 27   | 174    | 77  | 346    | 27   | 488    | 77  | 601    | 27   | 685    | 77  | 744    |
| 28   | 198    | 78  | 370    | 28   | 511    | 78  | 623    | 28   | 707    | 78  | 765    |
| 29   | 221    | 79  | 393    | 29   | 533    | 79  | 645    | 29   | 728    | 79  | 785    |
| 30   | 245    | 80  | 416    | 30   | 556    | 80  | 667    | 30   | 750    | 80  | 806    |
| 31   | 269    | 81  | 439    | 31   | 578    | 81  | 688    | 31   | 771    | 81  | 827    |
| 32   | 293    | 82  | 462    | 32   | 601    | 82  | 710    | 32   | 792    | 82  | 848    |
| 33   | 316    | 83  | 485    | 33   | 623    | 83  | 732    | 33   | 814    | 83  | 869    |
| 34   | 340    | 84  | 508    | 34   | 646    | 84  | 754    | 34   | 835    | 84  | 890    |
| 35   | 364    | 85  | 531    | 35   | 668    | 85  | 776    | 35   | 856    | 85  | 911    |
| 36   | 387    | 86  | 554    | 36   | 691    | 86  | 798    | 36   | 878    | 86  | 931    |
| 37   | 411    | 87  | 577    | 37   | 713    | 87  | 820    | 37   | 899    | 87  | 952    |
| 38   | 435    | 88  | 600    | 38   | 735    | 88  | 842    | 38   | 920    | 88  | 973    |
| 39   | 458    | 89  | 623    | 39   | 758    | 89  | 863    | 39   | 942    | 89  | 994    |
| 40   | 482    | 90  | 646    | 40   | 780    | 90  | 885    | 40   | 963    | 90  | 332015 |
| 41   | 505    | 91  | 669    | 41   | 803    | 91  | 907    | 41   | 984    | 91  | 035    |
| 42   | 529    | 92  | 692    | 42   | 825    | 92  | 929    | 42   | 331006 | 92  | 056    |
| 43   | 553    | 93  | 715    | 43   | 847    | 93  | 951    | 43   | 027    | 93  | 077    |
| 44   | 576    | 94  | 738    | 44   | 870    | 94  | 973    | 44   | 048    | 94  | 098    |
| 45   | 600    | 95  | 761    | 45   | 892    | 95  | 994    | 45   | 069    | 95  | 118    |
| 46   | 623    | 96  | 784    | 46   | 914    | 96  | 330016 | 46   | 091    | 96  | 139    |
| 47   | 647    | 97  | 807    | 47   | 937    | 97  | 038    | 47   | 112    | 97  | 160    |
| 48   | 670    | 98  | 830    | 48   | 959    | 98  | 060    | 48   | 133    | 98  | 181    |
| 49   | 694    | 99  | 852    | 49   | 981    | 99  | 081    | 49   | 154    | 99  | 201    |



| 2100 |        |     |        | 2200 |        |     |        | 2300 |        |     |        |
|------|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0    | 332222 | 50  | 333244 | 0    | 334242 | 50  | 335218 | 0    | 336173 | 50  | 337107 |
| 1    | 243    | 51  | 264    | 1    | 262    | 51  | 238    | 1    | 192    | 51  | 125    |
| 2    | 263    | 52  | 284    | 2    | 282    | 52  | 257    | 2    | 211    | 52  | 144    |
| 3    | 284    | 53  | 304    | 3    | 301    | 53  | 276    | 3    | 229    | 53  | 162    |
| 4    | 305    | 54  | 325    | 4    | 321    | 54  | 295    | 4    | 248    | 54  | 181    |
| 5    | 325    | 55  | 345    | 5    | 341    | 55  | 315    | 5    | 267    | 55  | 199    |
| 6    | 346    | 56  | 365    | 6    | 361    | 56  | 334    | 6    | 286    | 56  | 218    |
| 7    | 366    | 57  | 385    | 7    | 380    | 57  | 353    | 7    | 305    | 57  | 236    |
| 8    | 387    | 58  | 405    | 8    | 400    | 58  | 372    | 8    | 324    | 58  | 254    |
| 9    | 408    | 59  | 425    | 9    | 420    | 59  | 392    | 9    | 342    | 59  | 273    |
| 10   | 428    | 60  | 445    | 10   | 439    | 60  | 411    | 10   | 361    | 60  | 291    |
| 11   | 449    | 61  | 465    | 11   | 459    | 61  | 430    | 11   | 380    | 61  | 310    |
| 12   | 469    | 62  | 486    | 12   | 479    | 62  | 449    | 12   | 399    | 62  | 328    |
| 13   | 490    | 63  | 506    | 13   | 498    | 63  | 468    | 13   | 418    | 63  | 346    |
| 14   | 510    | 64  | 526    | 14   | 518    | 64  | 488    | 14   | 436    | 64  | 365    |
| 15   | 531    | 65  | 546    | 15   | 537    | 65  | 507    | 15   | 455    | 65  | 383    |
| 16   | 552    | 66  | 566    | 16   | 557    | 66  | 526    | 16   | 474    | 66  | 401    |
| 17   | 572    | 67  | 586    | 17   | 577    | 67  | 545    | 17   | 493    | 67  | 420    |
| 18   | 593    | 68  | 606    | 18   | 596    | 68  | 564    | 18   | 511    | 68  | 438    |
| 19   | 613    | 69  | 626    | 19   | 616    | 69  | 583    | 19   | 530    | 69  | 457    |
| 20   | 634    | 70  | 646    | 20   | 635    | 70  | 603    | 20   | 549    | 70  | 475    |
| 21   | 654    | 71  | 666    | 21   | 655    | 71  | 622    | 21   | 568    | 71  | 493    |
| 22   | 675    | 72  | 686    | 22   | 674    | 72  | 641    | 22   | 586    | 72  | 511    |
| 23   | 695    | 73  | 706    | 23   | 694    | 73  | 660    | 23   | 605    | 73  | 530    |
| 24   | 715    | 74  | 726    | 24   | 713    | 74  | 679    | 24   | 624    | 74  | 548    |
| 25   | 736    | 75  | 746    | 25   | 733    | 75  | 698    | 25   | 642    | 75  | 566    |
| 26   | 756    | 76  | 766    | 26   | 753    | 76  | 717    | 26   | 661    | 76  | 585    |
| 27   | 777    | 77  | 786    | 27   | 772    | 77  | 736    | 27   | 680    | 77  | 603    |
| 28   | 797    | 78  | 806    | 28   | 792    | 78  | 755    | 28   | 698    | 78  | 621    |
| 29   | 818    | 79  | 826    | 29   | 811    | 79  | 774    | 29   | 717    | 79  | 639    |
| 30   | 838    | 80  | 846    | 30   | 830    | 80  | 793    | 30   | 736    | 80  | 658    |
| 31   | 858    | 81  | 866    | 31   | 850    | 81  | 813    | 31   | 754    | 81  | 676    |
| 32   | 879    | 82  | 885    | 32   | 869    | 82  | 832    | 32   | 773    | 82  | 694    |
| 33   | 899    | 83  | 905    | 33   | 889    | 83  | 851    | 33   | 791    | 83  | 712    |
| 34   | 919    | 84  | 925    | 34   | 908    | 84  | 870    | 34   | 810    | 84  | 731    |
| 35   | 940    | 85  | 945    | 35   | 928    | 85  | 889    | 35   | 829    | 85  | 749    |
| 36   | 960    | 86  | 965    | 36   | 947    | 86  | 908    | 36   | 847    | 86  | 767    |
| 37   | 980    | 87  | 985    | 37   | 967    | 87  | 927    | 37   | 866    | 87  | 785    |
| 38   | 333001 | 88  | 334005 | 38   | 986    | 88  | 946    | 38   | 884    | 88  | 803    |
| 39   | 021    | 89  | 025    | 39   | 335005 | 89  | 965    | 39   | 903    | 89  | 822    |
| 40   | 041    | 90  | 044    | 40   | 025    | 90  | 984    | 40   | 922    | 90  | 840    |
| 41   | 062    | 91  | 064    | 41   | 044    | 91  | 336003 | 41   | 940    | 91  | 858    |
| 42   | 082    | 92  | 084    | 42   | 064    | 92  | 021    | 42   | 959    | 92  | 876    |
| 43   | 102    | 93  | 104    | 43   | 083    | 93  | 040    | 43   | 977    | 93  | 894    |
| 44   | 122    | 94  | 124    | 44   | 102    | 94  | 059    | 44   | 996    | 94  | 912    |
| 45   | 143    | 95  | 143    | 45   | 122    | 95  | 078    | 45   | 337014 | 95  | 931    |
| 46   | 163    | 96  | 163    | 46   | 141    | 96  | 097    | 46   | 033    | 96  | 949    |
| 47   | 183    | 97  | 183    | 47   | 160    | 97  | 116    | 47   | 051    | 97  | 967    |
| 48   | 203    | 98  | 203    | 48   | 180    | 98  | 135    | 48   | 070    | 98  | 985    |
| 49   | 224    | 99  | 223    | 49   | 199    | 99  | 154    | 49   | 088    | 99  | 338003 |



| 2400 |        |     |        | 2500 |        |     |        | 2600 |        |     |        |
|------|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0    | 338021 | 50  | 338917 | 0    | 339794 | 50  | 340654 | 0    | 341497 | 50  | 342325 |
| 1    | 039    | 51  | 934    | 1    | 811    | 51  | 671    | 1    | 514    | 51  | 341    |
| 2    | 057    | 52  | 952    | 2    | 829    | 52  | 688    | 2    | 531    | 52  | 357    |
| 3    | 075    | 53  | 970    | 3    | 846    | 53  | 705    | 3    | 547    | 53  | 374    |
| 4    | 093    | 54  | 987    | 4    | 863    | 54  | 722    | 4    | 564    | 54  | 390    |
| 5    | 112    | 55  | 339005 | 5    | 881    | 55  | 739    | 5    | 581    | 55  | 406    |
| 6    | 130    | 56  | 023    | 6    | 898    | 56  | 756    | 6    | 597    | 56  | 423    |
| 7    | 148    | 57  | 041    | 7    | 915    | 57  | 773    | 7    | 614    | 57  | 439    |
| 8    | 166    | 58  | 058    | 8    | 933    | 58  | 790    | 8    | 631    | 58  | 455    |
| 9    | 184    | 59  | 076    | 9    | 950    | 59  | 807    | 9    | 647    | 59  | 472    |
| 10   | 202    | 60  | 094    | 10   | 967    | 60  | 824    | 10   | 664    | 60  | 488    |
| 11   | 220    | 61  | 111    | 11   | 985    | 61  | 841    | 11   | 681    | 61  | 504    |
| 12   | 238    | 62  | 129    | 12   | 340002 | 62  | 858    | 12   | 697    | 62  | 521    |
| 13   | 256    | 63  | 146    | 13   | 019    | 63  | 875    | 13   | 714    | 63  | 537    |
| 14   | 274    | 64  | 164    | 14   | 037    | 64  | 892    | 14   | 731    | 64  | 553    |
| 15   | 292    | 65  | 182    | 15   | 054    | 65  | 909    | 15   | 747    | 65  | 570    |
| 16   | 310    | 66  | 199    | 16   | 071    | 66  | 926    | 16   | 764    | 66  | 586    |
| 17   | 328    | 67  | 217    | 17   | 088    | 67  | 943    | 17   | 780    | 67  | 602    |
| 18   | 346    | 68  | 235    | 18   | 106    | 68  | 960    | 18   | 797    | 68  | 619    |
| 19   | 364    | 69  | 252    | 19   | 123    | 69  | 976    | 19   | 814    | 69  | 635    |
| 20   | 382    | 70  | 270    | 20   | 140    | 70  | 993    | 20   | 830    | 70  | 651    |
| 21   | 399    | 71  | 287    | 21   | 157    | 71  | 341010 | 21   | 847    | 71  | 667    |
| 22   | 417    | 72  | 305    | 22   | 175    | 72  | 027    | 22   | 863    | 72  | 684    |
| 23   | 435    | 73  | 322    | 23   | 192    | 73  | 044    | 23   | 880    | 73  | 700    |
| 24   | 453    | 74  | 340    | 24   | 209    | 74  | 061    | 24   | 896    | 74  | 716    |
| 25   | 471    | 75  | 358    | 25   | 226    | 75  | 078    | 25   | 913    | 75  | 732    |
| 26   | 489    | 76  | 375    | 26   | 243    | 76  | 095    | 26   | 929    | 76  | 749    |
| 27   | 507    | 77  | 393    | 27   | 261    | 77  | 111    | 27   | 946    | 77  | 765    |
| 28   | 525    | 78  | 410    | 28   | 278    | 78  | 128    | 28   | 963    | 78  | 781    |
| 29   | 543    | 79  | 428    | 29   | 295    | 79  | 145    | 29   | 979    | 79  | 797    |
| 30   | 561    | 80  | 445    | 30   | 312    | 80  | 162    | 30   | 996    | 80  | 813    |
| 31   | 578    | 81  | 463    | 31   | 329    | 81  | 179    | 31   | 342012 | 81  | 830    |
| 32   | 596    | 82  | 480    | 32   | 346    | 82  | 196    | 32   | 029    | 82  | 846    |
| 33   | 614    | 83  | 498    | 33   | 364    | 83  | 212    | 33   | 045    | 83  | 862    |
| 34   | 632    | 84  | 515    | 34   | 381    | 84  | 229    | 34   | 062    | 84  | 878    |
| 35   | 650    | 85  | 533    | 35   | 398    | 85  | 246    | 35   | 078    | 85  | 894    |
| 36   | 668    | 86  | 550    | 36   | 415    | 86  | 263    | 36   | 095    | 86  | 911    |
| 37   | 686    | 87  | 568    | 37   | 432    | 87  | 280    | 37   | 111    | 87  | 927    |
| 38   | 703    | 88  | 585    | 38   | 449    | 88  | 296    | 38   | 127    | 88  | 943    |
| 39   | 721    | 89  | 602    | 39   | 466    | 89  | 313    | 39   | 144    | 89  | 959    |
| 40   | 739    | 90  | 620    | 40   | 483    | 90  | 330    | 40   | 160    | 90  | 975    |
| 41   | 757    | 91  | 637    | 41   | 500    | 91  | 347    | 41   | 177    | 91  | 991    |
| 42   | 775    | 92  | 655    | 42   | 518    | 92  | 363    | 42   | 193    | 92  | 343008 |
| 43   | 792    | 93  | 672    | 43   | 535    | 93  | 380    | 43   | 210    | 93  | 024    |
| 44   | 810    | 94  | 690    | 44   | 552    | 94  | 397    | 44   | 226    | 94  | 040    |
| 45   | 828    | 95  | 707    | 45   | 569    | 95  | 414    | 45   | 243    | 95  | 056    |
| 46   | 846    | 96  | 724    | 46   | 586    | 96  | 430    | 46   | 259    | 96  | 072    |
| 47   | 863    | 97  | 742    | 47   | 603    | 97  | 447    | 47   | 275    | 97  | 088    |
| 48   | 881    | 98  | 759    | 48   | 620    | 98  | 464    | 48   | 292    | 98  | 104    |
| 49   | 899    | 99  | 777    | 49   | 637    | 99  | 481    | 49   | 308    | 99  | 120    |



| 2700 |        |     |        | 2800 |        |     |        | 2900 |        |     |        |
|------|--------|-----|--------|------|--------|-----|--------|------|--------|-----|--------|
| Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   | Nu.  | Log.   | Nu. | Log.   |
| 0    | 343136 | 50  | 343933 | 0    | 344716 | 50  | 345484 | 0    | 346240 | 50  | 346982 |
| 1    | 152    | 51  | 949    | 1    | 731    | 51  | 500    | 1    | 255    | 51  | 997    |
| 2    | 169    | 52  | 965    | 2    | 747    | 52  | 515    | 2    | 270    | 52  | 347012 |
| 3    | 185    | 53  | 981    | 3    | 762    | 53  | 530    | 3    | 285    | 53  | 026    |
| 4    | 201    | 54  | 996    | 4    | 778    | 54  | 545    | 4    | 300    | 54  | 041    |
| 5    | 217    | 55  | 344012 | 5    | 793    | 55  | 561    | 5    | 315    | 55  | 056    |
| 6    | 233    | 56  | 028    | 6    | 809    | 56  | 576    | 6    | 330    | 56  | 070    |
| 7    | 249    | 57  | 044    | 7    | 824    | 57  | 591    | 7    | 344    | 57  | 085    |
| 8    | 265    | 58  | 059    | 8    | 840    | 58  | 606    | 8    | 359    | 58  | 100    |
| 9    | 281    | 59  | 075    | 9    | 855    | 59  | 621    | 9    | 374    | 59  | 114    |
| 10   | 297    | 60  | 091    | 10   | 871    | 60  | 637    | 10   | 389    | 60  | 129    |
| 11   | 313    | 61  | 107    | 11   | 886    | 61  | 652    | 11   | 404    | 61  | 144    |
| 12   | 329    | 62  | 122    | 12   | 902    | 62  | 667    | 12   | 419    | 62  | 159    |
| 13   | 345    | 63  | 138    | 13   | 917    | 63  | 682    | 13   | 434    | 63  | 173    |
| 14   | 361    | 64  | 154    | 14   | 932    | 64  | 697    | 14   | 449    | 64  | 188    |
| 15   | 377    | 65  | 170    | 15   | 948    | 65  | 712    | 15   | 464    | 65  | 202    |
| 16   | 393    | 66  | 185    | 16   | 963    | 66  | 728    | 16   | 479    | 66  | 217    |
| 17   | 409    | 67  | 201    | 17   | 979    | 67  | 743    | 17   | 494    | 67  | 232    |
| 18   | 425    | 68  | 217    | 18   | 994    | 68  | 758    | 18   | 509    | 68  | 246    |
| 19   | 441    | 69  | 232    | 19   | 345010 | 69  | 773    | 19   | 523    | 69  | 261    |
| 20   | 457    | 70  | 248    | 20   | 025    | 70  | 788    | 20   | 538    | 70  | 276    |
| 21   | 473    | 71  | 264    | 21   | 040    | 71  | 803    | 21   | 553    | 71  | 290    |
| 22   | 489    | 72  | 279    | 22   | 056    | 72  | 818    | 22   | 568    | 72  | 305    |
| 23   | 505    | 73  | 295    | 23   | 071    | 73  | 834    | 23   | 583    | 73  | 319    |
| 24   | 521    | 74  | 311    | 24   | 086    | 74  | 849    | 24   | 598    | 74  | 334    |
| 25   | 537    | 75  | 326    | 25   | 102    | 75  | 864    | 25   | 613    | 75  | 349    |
| 26   | 553    | 76  | 342    | 26   | 117    | 76  | 879    | 26   | 627    | 76  | 363    |
| 27   | 569    | 77  | 358    | 27   | 133    | 77  | 894    | 27   | 642    | 77  | 378    |
| 28   | 584    | 78  | 373    | 28   | 148    | 78  | 909    | 28   | 657    | 78  | 392    |
| 29   | 600    | 79  | 389    | 29   | 163    | 79  | 924    | 29   | 672    | 79  | 407    |
| 30   | 616    | 80  | 404    | 30   | 179    | 80  | 939    | 30   | 687    | 80  | 422    |
| 31   | 632    | 81  | 420    | 31   | 194    | 81  | 954    | 31   | 702    | 81  | 436    |
| 32   | 648    | 82  | 436    | 32   | 209    | 82  | 969    | 32   | 716    | 82  | 451    |
| 33   | 664    | 83  | 451    | 33   | 225    | 83  | 984    | 33   | 731    | 83  | 465    |
| 34   | 680    | 84  | 467    | 34   | 240    | 84  | 346000 | 34   | 746    | 84  | 480    |
| 35   | 696    | 85  | 483    | 35   | 255    | 85  | 015    | 35   | 761    | 85  | 494    |
| 36   | 712    | 86  | 498    | 36   | 271    | 86  | 030    | 36   | 776    | 86  | 509    |
| 37   | 727    | 87  | 514    | 37   | 286    | 87  | 045    | 37   | 790    | 87  | 524    |
| 38   | 743    | 88  | 529    | 38   | 301    | 88  | 060    | 38   | 805    | 88  | 538    |
| 39   | 759    | 89  | 545    | 39   | 317    | 89  | 075    | 39   | 820    | 89  | 553    |
| 40   | 775    | 90  | 560    | 40   | 332    | 90  | 090    | 40   | 835    | 90  | 567    |
| 41   | 791    | 91  | 576    | 41   | 347    | 91  | 105    | 41   | 849    | 91  | 582    |
| 42   | 807    | 92  | 592    | 42   | 362    | 92  | 120    | 42   | 864    | 92  | 596    |
| 43   | 823    | 93  | 607    | 43   | 378    | 93  | 135    | 43   | 879    | 93  | 611    |
| 44   | 838    | 94  | 623    | 44   | 393    | 94  | 150    | 44   | 894    | 94  | 625    |
| 45   | 854    | 95  | 638    | 45   | 408    | 95  | 165    | 45   | 909    | 95  | 640    |
| 46   | 870    | 96  | 654    | 46   | 423    | 96  | 180    | 46   | 923    | 96  | 654    |
| 47   | 886    | 97  | 669    | 47   | 439    | 97  | 195    | 47   | 938    | 97  | 669    |
| 48   | 902    | 98  | 685    | 48   | 454    | 98  | 210    | 48   | 953    | 98  | 683    |
| 49   | 917    | 99  | 700    | 49   | 469    | 99  | 225    | 49   | 967    | 99  | 698    |



## AUXILIARY TABLE;

*Intended to facilitate the Deduction of Charges, by shewing the Difference between the Logarithms of Numbers under 100, and the Logarithm of 100.*

At the head of the columns, or of the sections, are the whole numbers from 0 to 13, and the column to the left denotes the fractions from  $\frac{1}{16}$  to  $\frac{15}{16}$ . The logarithms which will be seen upon the same line are the logarithms of the whole numbers jointly with those fractions.

The manner of using the table is very simple. For instance, from the logarithm 197715, corresponding to the number  $94\frac{1}{8}$ , it is required to deduct  $3\frac{3}{16}$  per cent as the amount of charges: I look for the number 3, at the head of a column, and coming down to  $\frac{3}{16}$ , in the column of fractions, I find, under the number 3 upon the same line as  $\frac{3}{16}$ , the logarithm 1407, being that which I have to deduct from the logarithm 197715.

In fact, as the amount of the charges is  $3\frac{3}{16}$  per cent, it implies the reduction of 100 to  $96\frac{1}{8}$ , and the logarithmic quantity, 1407, is the same as the difference between the logarithm of 100 and that of  $96\frac{1}{8}$ ; as follows:

|                                           |             |
|-------------------------------------------|-------------|
| The logarithm of 100 is .....             | 200000      |
| The logarithm of $96\frac{1}{8}$ is ..... | 198593      |
| The difference is .....                   | <u>1407</u> |

and it is this difference which is pointed out by the Auxiliary Table.



| F.              | 0    | 1    | 2    | 3    | 4    | 5    | 6    |
|-----------------|------|------|------|------|------|------|------|
| 0               | 00   | 436  | 877  | 1323 | 1773 | 2228 | 2687 |
| $\frac{1}{16}$  | 27   | 464  | 905  | 1351 | 1801 | 2256 | 2716 |
| $\frac{1}{8}$   | 54   | 491  | 933  | 1379 | 1829 | 2285 | 2745 |
| $\frac{3}{16}$  | 82   | 519  | 961  | 1407 | 1858 | 2313 | 2774 |
| $\frac{1}{4}$   | 109  | 546  | 988  | 1435 | 1886 | 2342 | 2803 |
| $\frac{5}{16}$  | 136  | 574  | 1016 | 1463 | 1914 | 2371 | 2832 |
| $\frac{3}{8}$   | 163  | 601  | 1044 | 1491 | 1943 | 2399 | 2861 |
| $\frac{7}{16}$  | 190  | 629  | 1072 | 1519 | 1971 | 2428 | 2890 |
| $\frac{1}{2}$   | 218  | 656  | 1100 | 1547 | 2000 | 2457 | 2919 |
| $\frac{9}{16}$  | 245  | 684  | 1127 | 1575 | 2028 | 2486 | 2948 |
| $\frac{5}{8}$   | 272  | 712  | 1155 | 1604 | 2057 | 2514 | 2977 |
| $\frac{11}{16}$ | 300  | 739  | 1183 | 1632 | 2085 | 2543 | 3006 |
| $\frac{3}{4}$   | 327  | 767  | 1211 | 1660 | 2113 | 2572 | 3035 |
| $\frac{13}{16}$ | 354  | 794  | 1239 | 1688 | 2142 | 2601 | 3064 |
| $\frac{7}{8}$   | 382  | 822  | 1267 | 1716 | 2171 | 2629 | 3093 |
| $\frac{15}{16}$ | 409  | 850  | 1295 | 1745 | 2199 | 2658 | 3123 |
|                 | 7    | 8    | 9    | 10   | 11   | 12   | 13   |
| 0               | 3152 | 3621 | 4096 | 4576 | 5061 | 5552 | 6048 |
| $\frac{1}{16}$  | 3181 | 3651 | 4126 | 4606 | 5092 | 5583 | 6079 |
| $\frac{1}{8}$   | 3210 | 3680 | 4156 | 4636 | 5122 | 5613 | 6111 |
| $\frac{3}{16}$  | 3239 | 3710 | 4185 | 4666 | 5153 | 5644 | 6142 |
| $\frac{1}{4}$   | 3269 | 3739 | 4215 | 4697 | 5183 | 5675 | 6173 |
| $\frac{5}{16}$  | 3298 | 3769 | 4245 | 4727 | 5214 | 5706 | 6204 |
| $\frac{3}{8}$   | 3327 | 3799 | 4275 | 4757 | 5244 | 5737 | 6236 |
| $\frac{7}{16}$  | 3356 | 3828 | 4305 | 4787 | 5275 | 5768 | 6267 |
| $\frac{1}{2}$   | 3386 | 3858 | 4335 | 4818 | 5306 | 5799 | 6298 |
| $\frac{9}{16}$  | 3415 | 3888 | 4365 | 4848 | 5336 | 5830 | 6330 |
| $\frac{5}{8}$   | 3445 | 3917 | 4395 | 4878 | 5367 | 5861 | 6361 |
| $\frac{11}{16}$ | 3474 | 3947 | 4425 | 4909 | 5398 | 5892 | 6393 |
| $\frac{3}{4}$   | 3503 | 3977 | 4455 | 4939 | 5429 | 5923 | 6424 |
| $\frac{13}{16}$ | 3533 | 4006 | 4485 | 4970 | 5459 | 5955 | 6456 |
| $\frac{7}{8}$   | 3562 | 4036 | 4515 | 5000 | 5490 | 5986 | 6487 |
| $\frac{15}{16}$ | 3592 | 4066 | 4546 | 5031 | 5521 | 6017 | 6519 |



TABLE,  
*Shewing the Equivalence of Vulgar Fractions with Decimal  
 Fractions.*

| F.              | 100              | F.              | 100              | F.              | 100              | F.              | 100              |
|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| $\frac{1}{80}$  | $1\frac{2}{3}$   | $\frac{4}{15}$  | $26\frac{2}{3}$  | $\frac{31}{60}$ | $51\frac{2}{3}$  | $\frac{23}{30}$ | $76\frac{2}{3}$  |
| $\frac{1}{48}$  | $2\frac{1}{12}$  | $\frac{13}{48}$ | $27\frac{1}{12}$ | $\frac{25}{48}$ | $52\frac{1}{12}$ | $\frac{37}{48}$ | $77\frac{1}{12}$ |
| $\frac{1}{20}$  | $2\frac{1}{2}$   | $\frac{11}{40}$ | $27\frac{1}{2}$  | $\frac{21}{40}$ | $52\frac{1}{2}$  | $\frac{31}{40}$ | $77\frac{1}{2}$  |
| $\frac{1}{32}$  | $3\frac{1}{8}$   | $\frac{9}{32}$  | $28\frac{1}{8}$  | $\frac{17}{32}$ | $53\frac{1}{8}$  | $\frac{25}{32}$ | $78\frac{1}{8}$  |
| $\frac{1}{30}$  | $3\frac{1}{3}$   | $\frac{17}{60}$ | $28\frac{1}{3}$  | $\frac{8}{15}$  | $53\frac{1}{3}$  | $\frac{47}{60}$ | $78\frac{1}{3}$  |
| $\frac{1}{24}$  | $4\frac{1}{6}$   | $\frac{7}{24}$  | $29\frac{1}{6}$  | $\frac{13}{24}$ | $54\frac{1}{6}$  | $\frac{19}{24}$ | $79\frac{1}{6}$  |
| $\frac{1}{20}$  | 5                | $\frac{3}{10}$  | 30               | $\frac{11}{20}$ | 55               | $\frac{4}{5}$   | 80               |
| $\frac{1}{16}$  | $6\frac{1}{4}$   | $\frac{5}{16}$  | $31\frac{1}{4}$  | $\frac{9}{16}$  | $56\frac{1}{4}$  | $\frac{13}{16}$ | $81\frac{1}{4}$  |
| $\frac{1}{15}$  | $6\frac{2}{3}$   | $\frac{10}{60}$ | $31\frac{2}{3}$  | $\frac{17}{30}$ | $56\frac{2}{3}$  | $\frac{40}{60}$ | $81\frac{2}{3}$  |
| $\frac{3}{40}$  | $7\frac{1}{2}$   | $\frac{13}{40}$ | $32\frac{1}{2}$  | $\frac{23}{40}$ | $57\frac{1}{2}$  | $\frac{33}{40}$ | $82\frac{1}{2}$  |
| $\frac{1}{12}$  | $8\frac{1}{3}$   | $\frac{1}{3}$   | $33\frac{1}{3}$  | $\frac{7}{12}$  | $58\frac{1}{3}$  | $\frac{5}{6}$   | $83\frac{1}{3}$  |
| $\frac{3}{32}$  | $9\frac{3}{8}$   | $\frac{11}{32}$ | $34\frac{3}{8}$  | $\frac{19}{32}$ | $59\frac{3}{8}$  | $\frac{27}{32}$ | $84\frac{3}{8}$  |
| $\frac{1}{10}$  | 10               | $\frac{7}{70}$  | 35               | $\frac{3}{5}$   | 60               | $\frac{17}{20}$ | 85               |
| $\frac{5}{48}$  | $10\frac{5}{12}$ | $\frac{17}{48}$ | $35\frac{5}{12}$ | $\frac{29}{48}$ | $60\frac{5}{12}$ | $\frac{41}{48}$ | $85\frac{5}{12}$ |
| $\frac{7}{60}$  | $11\frac{2}{3}$  | $\frac{14}{30}$ | $36\frac{2}{3}$  | $\frac{37}{60}$ | $61\frac{2}{3}$  | $\frac{13}{15}$ | $86\frac{2}{3}$  |
| $\frac{1}{8}$   | $12\frac{1}{2}$  | $\frac{3}{8}$   | $37\frac{1}{2}$  | $\frac{5}{8}$   | $62\frac{1}{2}$  | $\frac{7}{8}$   | $87\frac{1}{2}$  |
| $\frac{2}{15}$  | $13\frac{1}{3}$  | $\frac{23}{60}$ | $38\frac{1}{3}$  | $\frac{19}{30}$ | $63\frac{1}{3}$  | $\frac{53}{60}$ | $88\frac{1}{3}$  |
| $\frac{7}{48}$  | $14\frac{7}{12}$ | $\frac{19}{48}$ | $39\frac{7}{12}$ | $\frac{31}{48}$ | $64\frac{7}{12}$ | $\frac{43}{48}$ | $89\frac{7}{12}$ |
| $\frac{3}{20}$  | 15               | $\frac{2}{5}$   | 40               | $\frac{13}{20}$ | 65               | $\frac{9}{10}$  | 90               |
| $\frac{5}{32}$  | $15\frac{5}{8}$  | $\frac{13}{32}$ | $40\frac{5}{8}$  | $\frac{21}{32}$ | $65\frac{5}{8}$  | $\frac{29}{32}$ | $90\frac{5}{8}$  |
| $\frac{1}{6}$   | $16\frac{2}{3}$  | $\frac{5}{12}$  | $41\frac{2}{3}$  | $\frac{2}{3}$   | $66\frac{2}{3}$  | $\frac{11}{12}$ | $91\frac{2}{3}$  |
| $\frac{7}{40}$  | $17\frac{1}{2}$  | $\frac{17}{40}$ | $42\frac{1}{2}$  | $\frac{27}{40}$ | $67\frac{1}{2}$  | $\frac{37}{40}$ | $92\frac{1}{2}$  |
| $\frac{11}{60}$ | $18\frac{1}{3}$  | $\frac{13}{30}$ | $43\frac{1}{3}$  | $\frac{41}{60}$ | $68\frac{1}{3}$  | $\frac{14}{15}$ | $93\frac{1}{3}$  |
| $\frac{3}{16}$  | $18\frac{3}{4}$  | $\frac{7}{16}$  | $43\frac{3}{4}$  | $\frac{11}{16}$ | $68\frac{3}{4}$  | $\frac{15}{16}$ | $93\frac{3}{4}$  |
| $\frac{1}{5}$   | 20               | $\frac{9}{20}$  | 45               | $\frac{7}{10}$  | 70               | $\frac{19}{20}$ | 95               |
| $\frac{5}{24}$  | $20\frac{5}{6}$  | $\frac{11}{24}$ | $45\frac{5}{6}$  | $\frac{17}{24}$ | $70\frac{5}{6}$  | $\frac{23}{24}$ | $95\frac{5}{6}$  |
| $\frac{13}{60}$ | $21\frac{2}{3}$  | $\frac{7}{15}$  | $46\frac{2}{3}$  | $\frac{43}{60}$ | $71\frac{2}{3}$  | $\frac{29}{30}$ | $96\frac{2}{3}$  |
| $\frac{7}{32}$  | $21\frac{7}{8}$  | $\frac{15}{32}$ | $46\frac{7}{8}$  | $\frac{23}{32}$ | $71\frac{7}{8}$  | $\frac{31}{32}$ | $96\frac{7}{8}$  |
| $\frac{9}{40}$  | $22\frac{1}{2}$  | $\frac{19}{40}$ | $47\frac{1}{2}$  | $\frac{29}{40}$ | $72\frac{1}{2}$  | $\frac{39}{40}$ | $97\frac{1}{2}$  |
| $\frac{11}{48}$ | $22\frac{1}{12}$ | $\frac{23}{48}$ | $47\frac{1}{12}$ | $\frac{35}{48}$ | $72\frac{1}{12}$ | $\frac{47}{48}$ | $97\frac{1}{12}$ |
| $\frac{7}{30}$  | $23\frac{1}{3}$  | $\frac{29}{60}$ | $58\frac{1}{3}$  | $\frac{11}{15}$ | $73\frac{1}{3}$  | $\frac{59}{60}$ | $98\frac{1}{3}$  |
| $\frac{1}{4}$   | 25               | $\frac{1}{2}$   | 40               | $\frac{3}{4}$   | 75               | $\frac{60}{60}$ | 100              |



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